TRS-80
OLOR REVIEW

Australian Personal Computer

January 1982
$2.50* NZ $3.00*

Australia's leading micro magazine

THE JAPANESE INVASION CONTINUES

Hitachi's 'Peach' Reviewed

IT HAD TO HAPPEN...

The new HITACHI PEACH out-performs any small business/personal system you may now be considering, but only costs $1495 plus sales tax if applicable

Includes numeric pads, ten programmable function keys (5 with shift), clock, speaker, power for 6809 CPU, (RS 232) centronics, light pen, audio, video) connections, six expansion slots for peripherals, 32k to 64k Ram, 24k Rom, advanced Microsoft Basic, machine language, complete documentation, main frame TERMINAL capabilities, 640 by 200 dot byte — addressable graphics, eight colours, upper/lower case, 40/80 columns and much more. Monitors, diskette drives, hard disks, CIS-COBOL, Pascal, Fortran, etc. are also available to complement the high standard, quality of the Hitachi computer range.

THE PEACH IS AVAILABLE FROM:

SYDNEY

CYBERNETICS RESEARCH (02) 698 8286
120-122 Lawson St, Redfern, 2016.

CISA (Your Down Town Dealer) (02) 29 1599
89 York St, Sydney, 2000

CITY PERSONAL COMPUTERS (02) 233 8992
75 Castlereagh St, Sydney, 2000.

CANBERRA

BOULEVARD BUSINESS
SERVICES (062 48 5411
P.O. Box 1903, Canberra, ACT, 2601.

MELBOURNE

COMPUTER COUNTRY (03) 329 7533
338 Queen St, Melbourne, 3000.

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DIRECT DATA (03) 690 1166
33 Bank St, South Melbourne, 3205.

ROBS ELECTRONIC
BARGAIN CENTRE (03) 791 2900
295 Thomas St, Dandenong, 3175.

NEW FORMULA MARKETING (03) 29 4466
1100 Toorak Rd, Hartwell, 3124. (03) 29 5570

MINIT COMPUTER SERVICE (054) 43 2579
119 McCrae St, Bendigo, 3550.

[redacted]

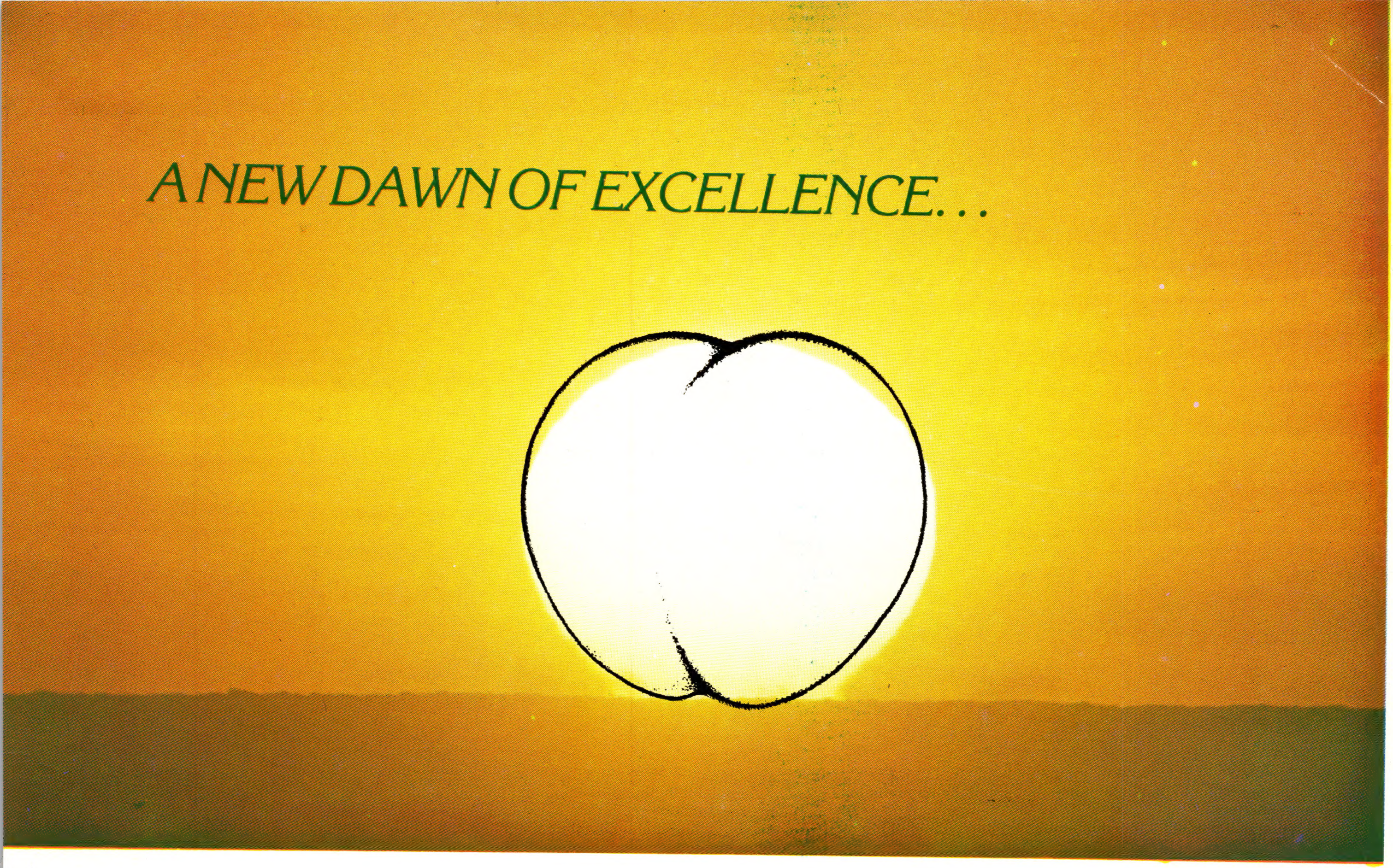
PERTH

MICRO-BASE (09) 328 9308
127 Fitzgerald St, West Perth, 6005.

Delta — Australian Distributors for Hitachi Personal Computers
4th Floor, 520 Collins Street, Melbourne. 03-62 2008.

HITACHI

Dealer enquiries welcome.


A NEW DAWN OF EXCELLENCE...

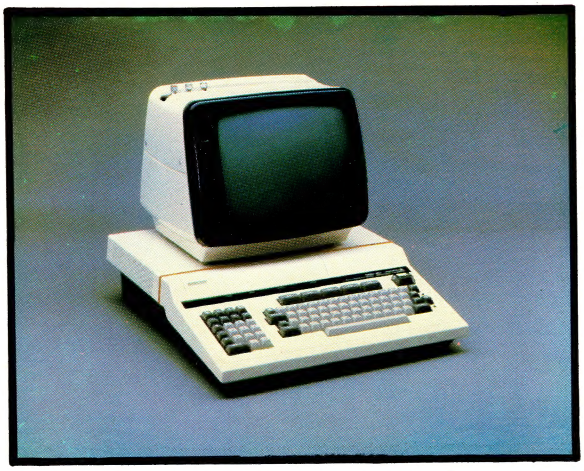
THE MOST POWERFUL SMALL COMPUTER IN THE WORLD
FOR UNDER $1500.00

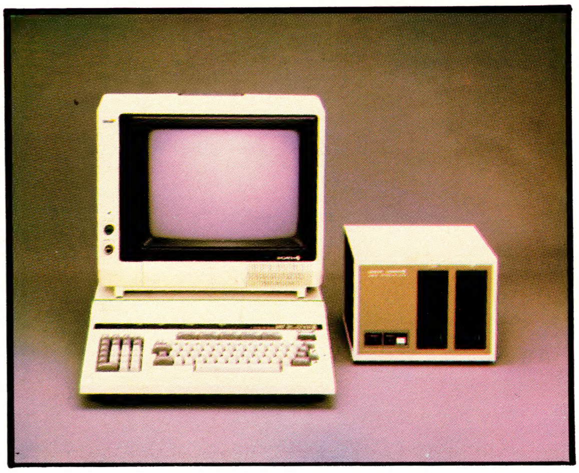
Over three hundred dealers have applied for rights to sell HITACHI's brilliant new PEACH, but only a very few will ever be selected. The requirements are very high, including proven record, financial stability, software and technical expertise, willingness to support total board level on-site repair and much more.

THE ELECTRONIC CIRCUIT is proud to announce that we are one of the chosen few, and the first in Queensland.

We represent the FUTURE;
We sell HITACHI.
Call or come by now for a demonstration.
THE ELECTRONIC CIRCUIT, (07 52 8455)

CISA IS PROUD TO BE SYDNEY'S FIRST DOWNTOWN HITACHI DEALER





PEACH PERSONAL COMPUTER FEATURES

USER MEMORY
32k – 1MB RAM

PERMANENT MEMORY
24k ROM

MICROPROCESSOR
High Speed 8/16 bit HD6809

ANCILLARY STORAGE
5¼" 80k, 5¼" 640k (dual), 8" 1MB, 8" 2MB (dual), 5, 10, 20, 40MB Hard Disk (Winchester)

KEYBOARD
86 Keys from which 262 symbols and functions are produced.
10 Function Keys (5 with shift)
Tactile Feedback
23 Key Numeric/Directional Pad
All keys are easy to read and use

SCREEN
Super high resolution 640 x 200 dots
40/80 characters x 25 lines
Upper and lower case
Green phosphor and many other monitors available

DIAGNOSTICS
Power-on self testing
Parity checking
Complete Diagnostics kit available

COLOUR GRAPHICS (STANDARD)
8 colours
262 characters and symbols
Simultaneous graphics and text
640 x 200 dots, 320 x 200 dots, 160 x 100 dots, 80 x 100 dots

LANGUAGES
MICROSOFT COLOUR BASIC (standard)
Machine Language (standard)
CIS COBOL
CP/M (with use of Z80A card)
PASCAL USDC
PASCAL ISO
059 Basic
FLEX
FORTRAN
Over 150 games, 30 graphics packages, word processing, hicalc, integrated financials all AUSTRALIAN produced

COMMUNICATIONS
RS232
CENTRONICS
Light pen
Colour video
Monochrome video
Six expansion slots
up to 9600 baud
OPTIONAL
IEE 488
Analog to Digital
Digital to Analog

PRINTERS
80 characters/second
180 characters/second
Letter quality and more . . .

MISCELLANEOUS STANDARD FEATURES
Clock
Speaker with volume control
Full documentation
Games/Graphic diskette/cassette
Membership to
THE AUSTRALIAN SOURCE
Membership in PEACH USER'S GROUP
Vast range of peripherals supported
UNEQUALLED HITACHI QUALITY
90 day warranty followed by full board level replacement by any dealer
Interactive software – computing made simple

CISA

CALL OR VISIT NOW:
89 YORK STREET, SYDNEY.
Ph: (02) 29 1599

SUBSCRIBE TO APC

Regular readers of this magazine will know that a campaign has been enacted on this page in the past few months.

APC's subscriptions are a major source of income for our publisher and in a wayward attempt to increase them he recently ran an insulting promotion suggesting our readers are a rather unloved crowd. As a result of this gross advertisement (which increased our subscription rate from approximately 40 per week to 70 per week) he has been forced by the editorial staff to renew his offer (of March, 1981) of a free binder, costing approximately $7.50 under normal circumstances, to new or renewal subscribers.

You may be interested to learn that his motives are not entirely penitential and that our readers are as greedy as the next bunch. As a result of this free offer last year, subscriptions rose to over 200 per week.

Now, 200 subscribers per week would, if the rate were kept up, give us 10,000 subscriptions per year approximately, compared with our recent total of over 3,000 per year . . . itself an increase of over 100 per cent from the same time last year. (We hope the publishers of rival magazines are taking note of all this.)

We won't bother with all the usual blurb about how APC is Australia's leading microcomputing magazine, the key to your future, the one that brings you genuine scoops, the most authoritative Benchtests, news and features. We assume you know this already. But we will send a $7.50 binder to every person subscribing (whether a new subscription, a renewal or a renewal in advance) who encloses full payment with their order. This offer will close next issue but we have produced only a limited number of these binders (3,500 to be exact) and it's first come, first served!

We are also happy to tell you that you can pay for your subscription using a cheque, postal order or Bankcard. Use the coupon below or the subscription card on page 17. You must include your remittance if you wish to receive your $7.50 binder (use of a credit card counts as a 'remittance included', of course). *AUSTRALIAN PERSONAL COMPUTER* would only offer you a genuine gifthorse, but it costs nothing to check out its mouth. And, while we're on the subject of gifthorses, you don't even need to put a stamp on your envelope.

I would like to subscribe to Australian Personal Computer for one year.

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Subscriptions Department, Freepost 10, 462 Burwood Road, Hawthorn. 3122.

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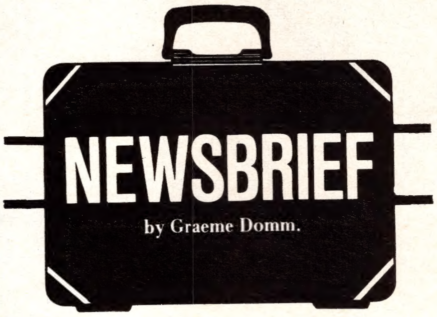

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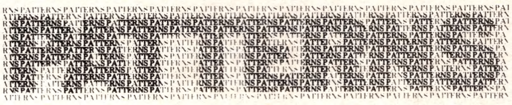
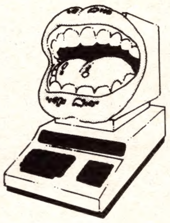
Disk Sorting Routine

35 Many different sorts have been published for the home computer user, but most of them have assumed that the data to be sorted can be stored in memory. When it comes to sorting alphanumeric codes and inventory part numbers for instance, a disk sort is necessary.



53 Alan Sutcliffe examines an area where art and computing meet.

MAN MACHINE AND MOUTH



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Due to industrial difficulties within Australia Post recently, several winners of our printer competition have yet to be notified of their success. Therefore, we are unable to publicise the winners names although it was too late to withdraw several winning entries from this issue's editorial content.

PRINTOUT

SCHOOL BOOK

The Australian Association for Direct Instruction has published a book called Microcomputers Don't Byte. Edited by Alex Maggs, Elaine Ray and Tony Webster, the book is an outgrowth of a seminar on microcomputing and direct instruction held at Macquarie University last September.

It is an introductory text for teachers, students and parents, and is one of the first books written in Australia by both educationists and computing specialists. The chapters cover the history of microcomputers and how they work, their use and maintenance in a teaching environment, and logic and language. There is also an introduction to music synthesisers.

It is available for $9.95, plus $2 postage, from Computer Reference Guide, Suite 204, 284 Victoria Ave, Chatswood, NSW 2067; Tel: (02) 411 2576.

A TYPE OF TALK

Dick Smith has a new speech synthesiser unit. The Votrax Type – 'N–Talk automatically translates English text into electronically synthesised speech. ASCII code from your keyboard is fed into the unit through an RS232C interface. Type –'N–Talk has its own built-in microprocessor and a 750-character buffer to hold typed words.

The vocabulary is claimed to be unlimited. Difficult words and phrases can be programmed in direct "phoneme" mode, with a code for each sound.

$525 gets you the unit, 240V power supply, and user manual. You have to supply a speaker and a connection cable. From Dick Smith stores. Watch for a review in APC soon.

JUST PEACHY

CISA Microcomputing is distributing the new Hitachi Peach in the Sydney city area. Eric Akroyd, of CISA, the Peach is the first attempt at offering a micro where the minimum unit is a fully professional one, upgradeable all the way. While CISA is not dropping Tandy, it will be heavly promoting the Peach.

Although the new Hitachi offering looks very impressive, particularly at the price, I've been wondering about software. Eric said that there are already about 100 games from the Japanese. A business package has already been developed, and CIS Cobol, Fortran and OASIS will also be available.

Disks are availabe from 5¼" single density to 8" high capacity. There are no modifications and outside dealer makes.

Eric also said there will be a "no secrets" selling, apart from the Microsoft ROM, which is restricted by Microsoft. Repair will be by board exchange.

CISA is at 89 York St, Sydney; Tel: (02) 291 599.

CLEANER SOLUTION

Magmedia is selling the Datalife cleaning disk, made by Verbatim in the US. It is disposable disk which removes contamination from drive heads. The disk will clean single or dual head drives. Available in 5¼" or 8" sizes, each cleaning disk is pre-saturated with a cleaning solution and sealed in a protective foil pack. Available from HQ at 5 Apollo Place, Lane Cove, NSW 2066; Tel: (02) 428 1100; and branches in other states.

WILL TRAVEL

For someone who has everything - a computer in a brief case. It's from the British company, Microdata Computers, and weighs less than 17 (evil, pre-metric) pounds, has a standard Qwerty key board, and comes in its own little carrying case. Called the Microdata 8400, it contains a word processor, an 8 by 8" viewing screen with a capacity of 480 characters, a telephone coupler, and a 94k bubble memory. The memory stores data and is not erased when power is switched off. Information can't be extracted without the use of a password.

From Microdata Computers, Belvedere Works, Bilto Way, Hayes, Middlesex, UB3 3ND England; Tel: (01) 848 9871.

BUSINESS ADVICE

A consulting service providing small business with an independent assessment of computer requirements has been established in Victoria.

The company, Micro-Computer Assessment Services Pty. Ltd, will give clients an analysis clearly defining the configuration, capacity and performance standards necessary for the required tasks.

Michael Grosvero, Director of MCAS said, "Before shopping for a computer, a businessman really needs to know his data storage and RAM memory requirements, processing speeds and software needs."

"Until now, most consulting services appear to have specialised in the needs of larger organisations, and on mainfram and minicomputers, and do not have the product knowledge or small business experience."

The company specialises only in microcomputer systems and the needs of small business, and can be found at 44 Regent St, Oakleigh, 3166; Tel: (03) 568 3811.

GENERAL DATA

Data General has a new desk top computer, the MPT100. It has a 16-bit processor, and 64K of local memory with 716k of minidiskette storage. The system has two RS232C synchronous/asynchronous ports, two 5¼" floppy disk drives, a 24 line by 80 character green phosphorous screen, and an 83-ke keyboard.

Languages include Fortran IV, Pascal, Basic, and assembly languages. Software utiltities include likers, editor, debugger and file transfer programs. It works under MP/OS, the single-user, multi-tasking operating system.

Though designed as a technical computer, Data General said that it would be just as useful in a commercial environment – all DG's Micro-Nova software will run, providing it fits into the 64k. Technical applications include engineering and scientific computations, data acquisistion and software control, laboratory automation and medical diagnostics.

The price is $6,634. Data General's head office is at 30 Ellingworth Parade, Box Hill, Victoria 3128; Tel: (03) 831 3311.

THE END IS NIGH

Robert F. Wickham, Vector Graphic's vice president of marketing in California, has predicted the end of dedicated word processors. He has been quoted as saying that with the invasion of microcomputers, users realise that they can have word and data processing in a single mult-purpose system with resulting economy and efficiency. He noted that many microcomputer manufacturers are already bringing out systems which perform both word and data processing, along with the applications software necessary to make this mult-use approach workable.

BOOK POWER

Powerchip Software has a series of books, written in the US, for use with the Tandy TRS-80 and Sharp PC1211 pocket computers. Using Basic, the books provide step by step guides to programming. Both business and entertainment applications are available and although they are specifically intended for use with the pockets models, the programs can be modified to run on larger computers.

Some of the business programs include Profit Estimator, Invoice Totalling, and Wages and Overtime. Each program sets out the steps to follow and then gives a sample run.

There are twelve books in the current series, and they can be bought individually or as a package. Titles include 101

PRINTOUT

Tips and Tints, an Programming for the Home, School and Office.

Powerchip Software can be contacted at P.O. Box 32, Sth Caulfield, Vic 3162, or or (03) 509 2884.

DRIVE CONTROL

Disk drive controllers are available in the US, which integrate up to four 5¼" Winchester drives, interfacing to popular micros such as Apple 11, TRS-80, S-100 and multi-bus. The DTC - 510, costing $US650, controller handles up to Winchester drives. The DTC-520, at $US750, handles up to four drives in any combination of 5¼" Winnie and flexible mini-floppy (IBM compatible single or double density, single or double sided). Both controllers feature microporcessor intelligence, single board design, and shared power supply with the same power requirements as the drives.

Controller functions include overlapped seek, logical to physical unit correlation, automatic head and cylinder switching, odd parity checking, error detection and correction, fault detection and integral data separation.

They are from Data Technology Corporation, 2344A Walsh Ave, Santa Clara, CA 95051; Tel: (408) 496 0434.

ADVANTAGEOUS PICTURES

ADE has put the NorthStar Advantage graphics system onto the Australian market. It's an integrated, interactive graphics computer giving business data, word, or scientific data processing capabilities, with both character and graphics output.

It has a 12" bit-mapped 64k of RAM, a Z80A processor, two quad-capacity floppy disk drives, selectric-style 87-key key board, and business graphics software.

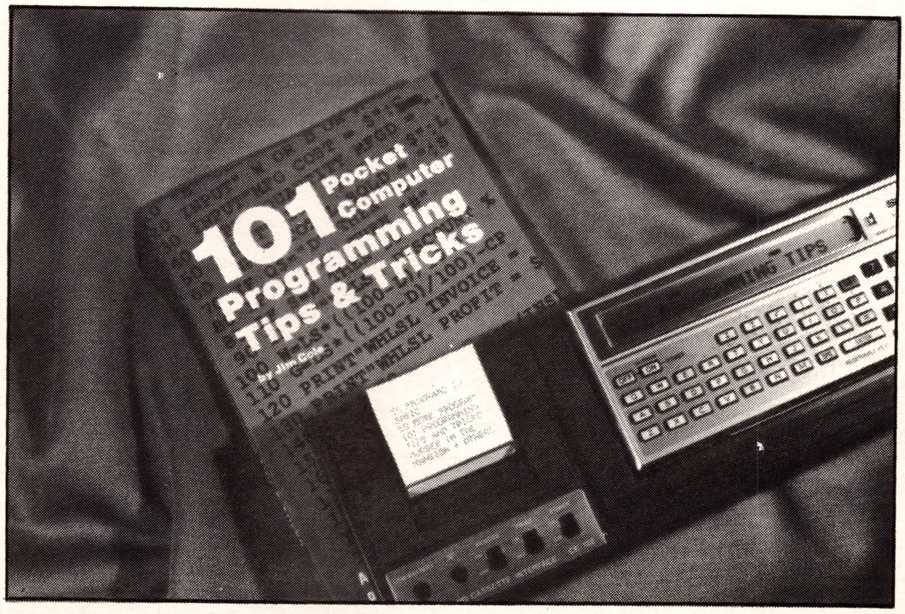
A separate 20k RAM drives the display, a 2k PROM and an auxiliary Intel 8035 microprocessor control the keyboard and floppy disks.

The display can be operated as a 1920 (24 lines by 80 characters) character display, or as a bit-mapped display (240 by 640 pixels) where each pixel is controlled by one bit in the 20k display RAM. The two integrated 5¼" floppy disks are double-sided, double-density, providing 720k of storage.

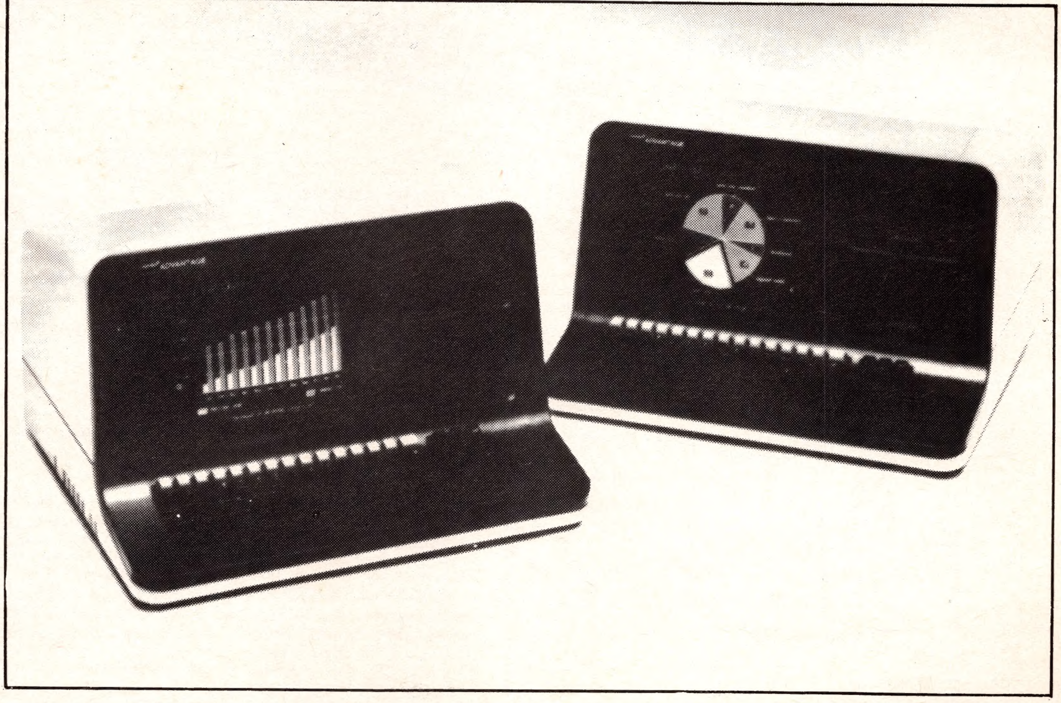
It is housed in a desk top chassis containing six slots for plug-in option cards, a parallel interface for printer or other parallel devices, a serial (RS232C) port or a NorthStar Floating Point Board for computation.

Included with the Advantage is a system diskette containing a Business Graphics Package, a system diagnostic program and a graphics demo pack.

For the business user, NorthStar offers proprietary Application Software modules controlled by NorthStar's Application Support Program.



The Sharp pocket computer with one of the Powerchip Software books.



The NorthStar Advantage microcomputer demonstrating its graphics capabilities.

PRINTOUT

NorthStar's graphics version on CP/M is offered in a variety of commercial, scientific or industrial applications.

It costs around $5,000 and is distributed by Anderson Digital Equipment which can be contacted on (03) 544 3444, or by writing to P.O. Box 422, Clayton, Vic. 3168.

LOCAL CONTENT

The Datamax 8000 is being promoted as having more Australian content than most computers which are Australian made. The primarily OEM-targeted unit was designed by electronic engineer Chin K. Kwong and is being manufactured by his company, Datamax.

The following features are contained on the single board: a Z80 CPU with 158 instructions including 16 bit arithmetic; 64k of dynamic RAM with the option of using 64K chips to lift the on-board capacity to 256k; a double-density floppy disk controller with handles up to four floppy disk drives; circuitry for two parallel ports, four serial ports, IEEE 488 GPIB instrumentation interface, floating point arithmetic interface, hard disk adaptor, S100 bus adaptor and a calendar clock with battery back-up.

Input-output peripherals connect directly onto standard connectors on the board, and diagnostic tests for vital functions are also built-in for faster servicing.

System software is CP/M and a full range of supporting high level languages: Cobol, Fortran IV, Basic interpreter and comiler, Pascal, C compiler, APL and Forth. Extension to multi-user facilities is available through MP/M.

Mr Kwong claims high reliability because the single board eliminates inter-circuit board connectors and shortens signal path lengths. He also said that the single board consumes only one third the power needed by conventional boards, and allows lower assembly costs and mass production.

He sees the unit in low-cost, professional-grade, custom designed configurations for business accounting, office automation, industrial process control and scientific measurement and data processing; and also, because of its low cost, the serious computer enthusiast who wanted to configure his own system would find it attractive.

Datamax is at 34 – 40 Central Ave, Manly, NSW 2095; Tel: (02) 977 6522.

TAPED TRAINING

It was described as 'a little bit unique' at its launch – the first computer designed to operate a videotape player. Sony launched it and called it the Video Responder, and very nice it was too.

It's supposed to be used for training. The film is operated entirely by the Responder, so all the student has to do is put the video cassette in the machine and start it up. The Responder even tells the student to do this. The tape loads a program (computer, not training) into the processor. This tells it to stop at various marks on the tape and which marks to move to from there.

For example, it starts off by playing a section of video showing how to boil an egg. It (the film) then asks the student a question, such as,

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February 7-8, Lennons Plaza Hotel BRISBANE
February 28-March 2, Centrepoint SYDNEY
March 7-9, Southern Cross Hotel MELBOURNE
March 23, Parmelia Hilton PERTH
March 27, The Festival Centre ADELAIDE

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Please Print
Name ....
Address ....
Suburb .... State .... Postcode ....

Coupon not valid where it contravenes state law

'Do you need to boil the water before putting the egg in, or do you put the egg in before boiling the water?' The student is told to press button 1 for yes, button 2 for no, and button 3 if he doesn't understand.

Then, if the machine has been properly set up, it will rewind to play the piece of tape which dealt with how the water was boiled, if the student got it wrong. Or it will repeat the whole first section if the student didn't understand. Or it will move onto the next section, if the student got it right. Or perhaps it will do something else – for example, it can see how long it takes the student to answer and it can play a different section, if the tutor thought that slow answers required different teaching. This is known as 'interactive video' in the new trade of interactive video.

Up till now, it has been the preserve of people like Mike Sterland who have connected up a disk video player and controlled it with and Apple. The Video Responder is a lot cheaper, but the Apple scores over it in the way it can display messages on the video along with the picture, and in the fact that the messages are a lot more under control of the producer.

Guy Kewney

ATTENTION PRINTER SUPPLIERS/MANUFACTURERS

A forthcoming cover "story" of APC will be a detailed survey of every computer printer available on the Australian market. The printer survey will be a valuable reference source for the large number of people considering purchasing printers during 1982. If you have not already received our questionnaire please advise us immediately so we can despatch it to your company.

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NEWSBRIEF

by Graeme Domm.

APPLE TAKES A BITE

The president of Apple Computer, Mike Markkula, surprised delegates at a US computer show when he called for a halt to the use of copy protection devices in software.

Speaking in a forum on the future of personal computers, Mr Markkula said money was being wasted trying to find ways of effectively protecting software. Money saved by dropping such work could lead to better products.

Adequate copyright laws would better serve the industry, Mr Markkula said. "I believe that software protection will eventually go away . . . the sooner the better."

According to a report in Australasian Computerworld, other panellists disagreed with Mr Markkula. Jon Shirley, vice president of merchandising for Tandy/Radio Shack, said software development was not the only major expense for manufacturers to bear. Support of software was also expensive, he said.

Commodore president H.E. James Finke told the forum it was "time to enter the Vatican II of computer technology". This was an apparent reference to the need to cater to changing public demands.

Mr Finke and other speakers said there was a need for hardware and software developers to meet the needs of a non-technical marketplace, where "user friendly" systems were all-important. The ultimate user of computer systems was increasingly becoming the general public.

PROGRAMME ON PROGRAMS TAKES OFF

ABC television is about to evaluate a 10 episode BBC television programme about programming and using micro-computers.

The series has generated enormous response in the UK weeks before it is due to go to air. The deputy sales director for BBC Enterprises, John Harrison, was in Australia last month to discuss the series.

The programme, which has just finished the filming stage, is designed to introduce lay people to the world of computers and to show them how to program and use a micro. The 10 part programme will be offered with supporting services, including a specially built microcomputer with graphics and colour capability, software on audio cassettes, an instruction book and a correspondence course. Each component can be used on its own, or with the others.

Publicity in Britain has brought more than 6000 orders for the micro-computer.

COMPUTER CHANGES ACCOUNTANT'S LIFESTYLE

Imagine the problems of a "sole practice" accountant, with 40 years in the business and a serious heart attack just behind him.

This was the dilemma faced by Melbourne accountant Ernest Gras when he made his decision to buy a microcomputer, and chose the Alphatronic, made by Adler.

"I was worried about properly servicing my clients, whose demands were constantly increasing while I was not getting any younger", he said. "I also recognised the need to slow down a little after my heart attack, and enjoy a little more leisure".

Mr Gras said he had a good look around before choosing a micro-computer to meet his special needs.

He once waded through boxfuls of cheque butts and pay-in slips, and laboriously entered up ledgers for reconciliation and eventual consolidation for the profit and loss account. "These days, I code all items by category, post as I go, and get a running profit and loss whenever I want it", he said.

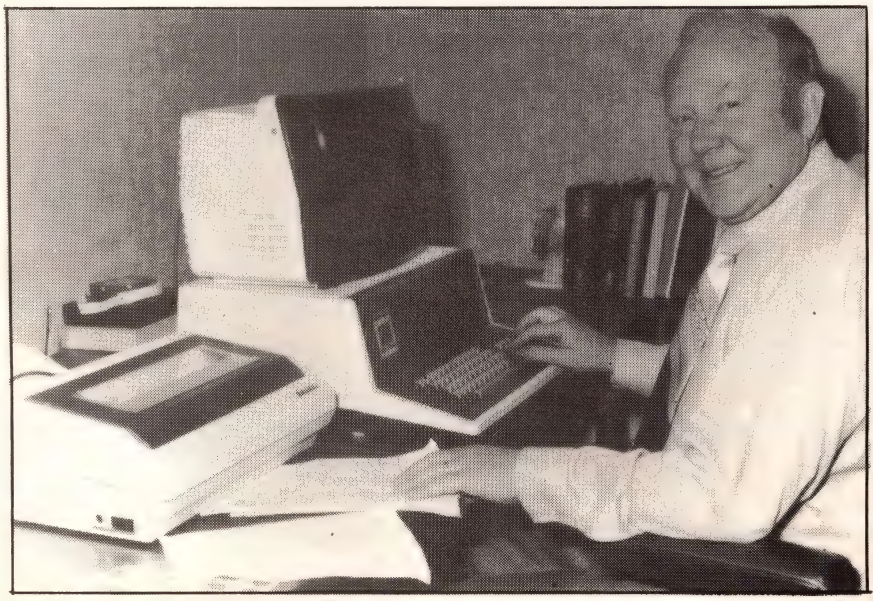
"Once that's done, it's the end of it. I save time, and often finish my day's work early instead of going on into the evening"

"If you use the manual and follow the instructions carefully, there are no real problems", he said.

The Alphatronic offers a full size visual display screen, and the option of one or two 5¼ inch mini disk drives, enabling program and data storage.

The high-speed, dot matrix printer takes single sheets, telex roll or continuous form up to A4 width, and prints at 80 characters per second.

Information on the system is available from Adler offices in all states, where software, backup maintenance, servicing and training facilities are also provided.



Accountant Mr Ernest Gras with his micro.

NEWSBRIEF

by Graeme Domm.

FINANCIAL SOFTWARE

The Computer Company has released a set of financial modelling software to help in budget planning and forecasting.

Called Panaplan, the software is designed to help administrative, accounting, marketing and engineering personnel. It operates on TCC's Panasonic range of microcomputers and, according to the company, it can be applied to almost any application involving the manipulation of numerical data.

This includes anything from basic financial reports through to detailed "what if?" modelling analysis. The software can generate comprehensive manufacturing schedules as well.

Using pre-defined headings and descriptions, Panaplan displays rows and columns into which data is entered. Inbuilt screen prompts and a comprehensive range of input commands speed the process of data entry. When a complete table has been created, Panaplan's editing facilities allow data within any row or column to be changed, added to or deleted.

TCC says this facility is particularly suited to "what if?" analysis. By changing the various parameters and data to reflect new contingencies, the user can see the effect on the table.

Several built in formulae are included to help in calculating depreciation schedules, discounted cash flow and other items. The software can produce bar graphs, line charts and x/y plots to display the results of statistical calculations. A report generator allows the user to produce reports to his or her own design.

More information is available from Tom Jensen at The Computer Company (ph: 02 436 1733).

AUSTRALIA FACES DEPENDENCE

Australia faces the danger of total dependence on overseas technology unless it improves its performance in the microelectronics field. This is the warning of a report produced by the Australian Science and Technology Council.

The report says that money is the greatest problem facing local producers and those who are interested in research into high technology fields. Microelectronics has a half life of around five years, the report says; about half the technology now in use will be obsolete within five years.

The council expects Australian demand for microelectronic devices to be worth about $300 million a year by the late 1980s. Present Australian production is worth about $4 million, and in 1979/80 Australia imported microelectronic devices valued at $18 million.

The council says that Australia needs a strong local production capacity for its own security. The council's main recommendations are:

- That the Government recognises the importance of microelectronic technology to Australia's future needs;
- That the Industries Assistance Commission be asked to consider the introduction of a bounty to replace tariffs as the main method of Government support for Australian production of microelectronic devices;
- That the Government gives preferences to local products and have an "offset" policy for overseas purchases;
- That any proposal from an overseas supplier for the establishment of a microelectronics facility in Australia involving Government support be required to have provisions for "favoured nation" access to the manufacturer's range of products, and adequate technology transfer to Australia.
- That public interest grants under the Australian Industrial Research and Development Incentives Scheme give particular attention to the development of microelectronics.

DATA FREELY AVAILABLE

Australian business computer users do not realise how much data is readily available to them, in the view of Chris Sanderson. Mr Sanderson, managing director of a computer time-sharing and consulting company, I.P. Sharp, is reported to have said recently that Australian computer users were at "the same point as the car industry when only chauffeurs could drive".

In an apparent reference to data processing professionals, he said (according to the Melbourne "Age"): "Sometimes it is hard to persuade the chauffeur to move over and give us a go, let alone teach us to drive. I've talked to so many managers and professionals who know perfectly well how much more productive they could be if they had access to, and knew how to drive, a computer terminal or micro."

Mr Sanderson said Australian data for use by business was widely, and in most cases freely, available. This included stock market and commodity prices, company balance sheet data, and statistical information from the Australian Bureau of Statistics.

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ID's WORKSHOP

This month we introduce a new regular feature to APC, designed to cater for everyone who really enjoys getting to grips with their micros – all you 'terminal junkies' in fact. From now on we'll be publishing a wealth of hardware fixes and software tricks for all the popular machines. But we depend on your help in sending us your favourite tips – we'll even pay you for them. Send your input to: ID's Workshop, APC, 462 Burwood Road, Hawthorn, 3122.

TRS-80 INVERSE VIDEO

Inverse video on the TRS-80 and probably most micros may be accomplished with minimum effort and expense. The following modification may be done in approximately one hour. You will need no more than a switch and some wire.

Carefully unscrew the bottom of your keyboard while noting the screw lengths and locations for reassembly. Remove the top cover. Lift the keyboard to separate it from the main board below. Take care not to twist the short length of ribbon cable that connects the two boards. Remove the small white cushions from the pegs that supported the keyboard, again noting their locations. Lift the lower main board and the keyboard out of the case. It is advisable that you have an extra pair of hands available for the next operation. Carefully separate the two boards and lay them flat so that the keyboard faces upward. Locate the DIN socket end of the main printed board, Z41 and Z24, the former being an eight pin chip, the latter a 16 pin. When you are satisfied that you have found the correct two chips, invert the two boards and try to pinpoint the soldered connections for both chips on the reverse side of the board. When you have located the correct ones, mark both areas with a felt pen.

Now stand facing the board with the power, video and tape sockets nearest to you. Z41 and Z24 should be on the left side of the board. Look closely at Z41 and compare the right middle two pins with the diagram. You should see that the two pins are soldered together and a track leads off away from you. If you are in any doubt about which pins you should be looking at, count clockwise from the bottom left-hand pin, pin one, until you reach pins six and seven, the two in question.

Check once more that you have the correct chip and then cut the track leading away from pins six and seven with a modelling knife. Now locate Z24 and cut the track leading away from the two pins four and five, as shown on the diagram. That's the difficult part over with.

The switch may be mounted anywhere on the cabinet, but if you have a very small switch handy you will find room to mount it between two of the DIN sockets.

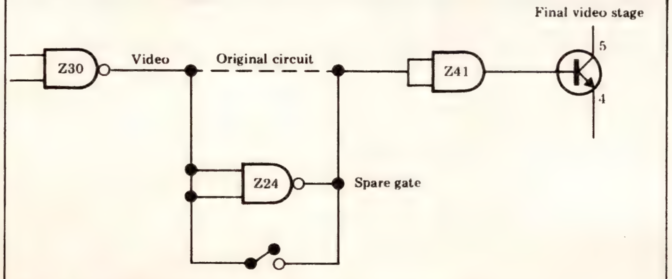


Fig 1 Logic diagram for TRS-80 reverse video mod.

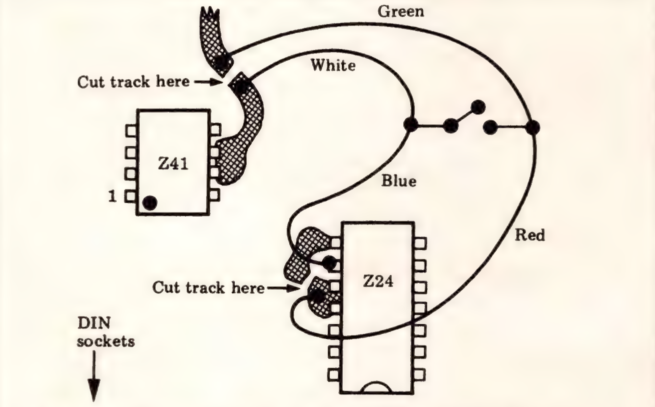


Fig 2 The modifications to the Tandy board. Note that this is a view of the underside.

Now for the wiring. The ideal wire to use would be a four-cored screened cable, with the screening earthed to prevent pickup and hence patterning on the display. Whether you are using screened cable or not, wire as per the diagram. You will find it less confusing if you use wire of four different colours. If you have used screened cable then pin seven of Z24 will provide a suitable earth for your screen.

When you have finished, check again the diagram against your work and when you are satisfied that it is correct, reassemble and give it a try.

If you don't own a TRS-80, you might still be able to modify your machine for reverse video. Locate on the circuit diagram the video output stage. You will probably see leading into the circuit two signal lines. One of these lines should be labelled 'sync' and the other 'video'. It is the video line we are interested in. To invert the video to the screen all you need to do is to invert the signal at this position. There will probably be a spare NAND gate somewhere on your micro which you can use. Break the video line and wire your gate in series with the two open lines. To enable switching between normal and inverted video, simply connect your switch across the input and output terminals of the gate.

This modification works perfectly well on the Tandy monitors, but if you are using a standard television receiver, you may find that it suffers a loss of sync when displaying large areas of black.

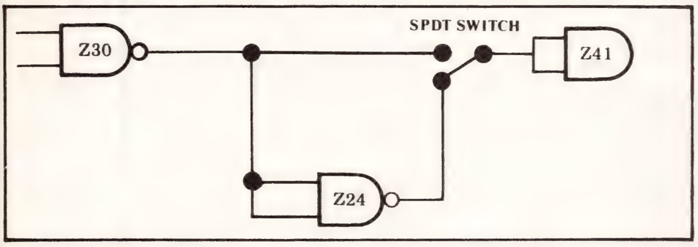
Note: the ribbon cable joining the keyboard to the main printed board is of very poor quality and the copper track inside is easily broken. The symptoms of a break vary depending on which

ID's WORKSHOP

TRS-80 INVERSE VIDEO

particular track is broken. If one is broken, you will probably find it impossible to make an entry via the keyboard as random characters will be printed on the screen when you press a key.

Note: The TRS-80 mod could overload Z24 by connecting its output to its own input, causing it to oscillate. This can be overcome by using an SPDT switch, as shown below.



LOWER CASE LISTer

This PET program will let you produce listings with lowercase characters. You have to store the program as an ASC data file on tape, using OPEN 1,1,1:CMD 1:LIST to save it on cassette 1. Close the file with PRINT 1:CLOSE 1 and then use this program to translate the tape file to the printer. The program also allows a doubled character title to be used, as well as allowing double-spaced lines and splitting the listing into pages, which prevents program lines being printed on perforations.

```
100 rem lists on printer a programme saved in asc form on tape
110 poke 59468,14
120 print chr$(147)
130 input"Name of programme";z$
140 print:input"Double (d) or single (s) spacing";y$
150 if len(y$)>1 then y$=left$(y$,1)
160 open 1,1,0
170 open 4,4
180 print#4,chr$(14);z$
190 get#1,a$
200 if st=64 or st=128 then close 1:close 4:end
210 a=asc(a$)
220 if a>64 and a<91 then a=a+32
230 if a>192 and a<219 then a=a-128
240 if a=13 or a=141 then a$=chr$(13)+chr$(10):z=z+1:goto 270
250 if a<32 or a>126 then 190
260 a$=chr$(a)
270 if a$=chr$(13)+chr$(10) and y$<>"s" then a$=a$+a$'
280 print#4,a$;
285 if z>58 or(z>29 and y$<>"s") then z=0:print#4,chr$(12)
290 goto 190
```

TRS-80 LIFESAVER

This program is an invaluable utility to any disk-based TRS-80 owner who uses either 'Electric Pencil' or 'Scripsit'.

Should an error occur in saving text to disk or should there be any software or hardware failure, the user could be in a situation of having valuable text in the memory of the computer with no means of recovering it.

In the majority of cases RESCUE will transfer this text to disk; there is however a possibility that the latter part of a relatively large block of text could become degraded by Basic's string storage and stack. As an alternative there is a machine language program called HELP which is guaranteed to save all 'Pencil' or 'Scripsit' text after a reboot, DOS error or disk crash.

```
             TRS80 SCRIPSIT & ELECTRIC PENCIL
             ================================

    RECOVERY OF TEXT FROM MEMORY AFTER A REBOOT
               DOS OR HARDWARE FAILURE



 5  REM  COPYRIGHT (C) 1981 LAURIE SHIELDS
10  ON ERROR GOTO 80
20  CLS:
    PRINT:
    PRINT "F I L E   R E S C U E"
30  PRINT:
    INPUT "SCRIPSIT OR PENCIL"; A$
40  IF LEFT$( A$, 1) = "S" THEN N = 32610 ELSE
    IF LEFT$( A$, 1) = "P" THEN N = 27650 ELSE 30
50  LINEINPUT "FILESPEC ? "; A$:
    OPEN "O", 1, A$
60  IF N ) 32767 THEN N = N - 65536
70  C = PEEK(N):
    PRINT CHR$(C);:
    PRINT#1,CHR$(C);:
    N = N + 1:
    IF C () 0 THEN 60 ELSE
    FOR N = 1 TO 256:
    PRINT#1, " ";:
    NEXT:
    GOTO 90
80  CMD"E"
90  CLOSE:
    END

PROCEEDURE:
===========

1.   DON'T SWITCH OFF.

2.   RE-BOOT DOS WITH WITH ENTER KEY DOWN

3.   FORMAT NEW DATA DISC IF NECESSARY.

4.   ACTIVATE BASIC.
     (BUT WITH ONLY 1 FILE IF IT WAS PENCIL TEXT)

5.   DO NOT USE ANY NEWDOS TYPE CMD COMMANDS.

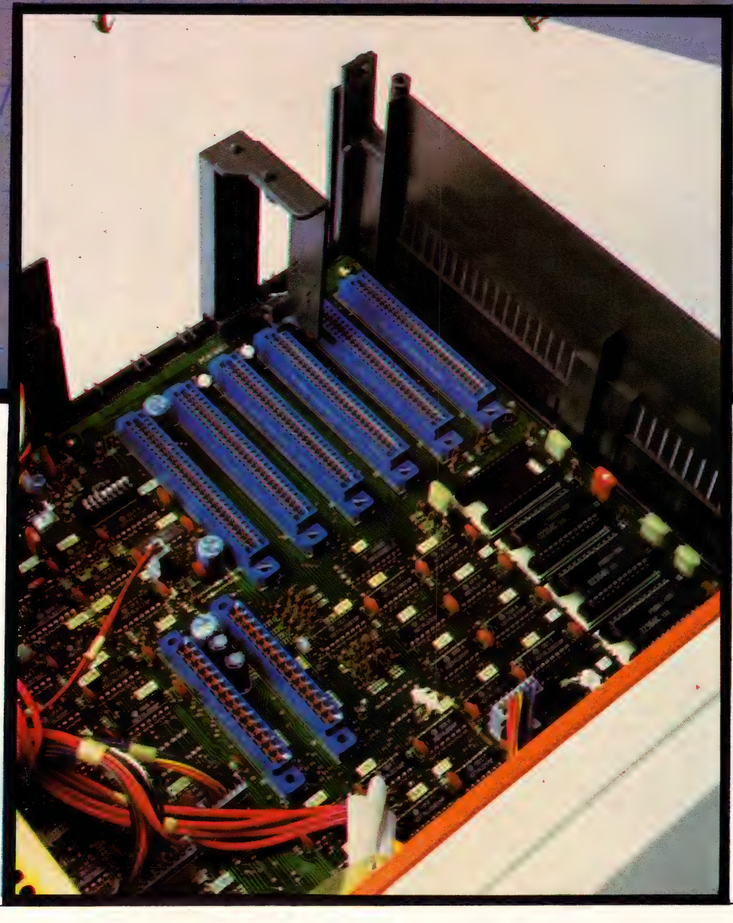
6.   RUN "RESCUE"

7.   ORDER 'HELP/CMD' BEFORE IT HAPPENS AGAIN.
```

ZX80 TIPS

POKEing location 16421 with a value over 10 will prevent an error code being printed by the ZX80. This is desirable because the ZX80 will print an error code for the quite legitimate operation of a stop statement and the appearance of a strange number at the bottom of the screen will confuse the inexperienced user.

A radio tuned to long wave at around 200 kHz will play a tone when placed near the ZX80, but don't place it too near the television set. Thus, the ZX80 can be used to play tunes with simple programs.



Internal view showing the two memory sockets and six expansion slots.

THE PEACH

It appears that the current trend in the microcomputer industry is to name machines after pieces of fruit, and the new personal computer from Hitachi is no exception. Officially designated the Hitachi Personal Computer Basic Master Level 3, it is being marketed in Australia as the "Peach". Ian Davies reviews the machine.

Introduction

The Peach is a low cost, high performance microcomputer based on the popular 6809 CPU chip including high resolution colour graphics, built-in expansion interface and standard features which would be extras on most other machines.

The Hitachi corporation is using Australia as a testing ground for their machine before releasing it to the US and European markets. So we find ourselves in the rare position of being about 12 months in front of the rest of the world. This is a tremendous opportunity for the Australian software industry to export applications software internationally. If the Peach is as successful as everyone seems to think it will be, it will create a huge impact on the US market and, in the initial software void that follows the release of any new machine, Australian software should be in great demand.

Hardware

The machine itself seems to be aimed at the Apple market, and could almost be described as an "Apple IV" done right. It comes standard with 24k of ROM, providing a very extensive Microsoft Basic. Its graphics output supports eight colours, including black, on a matrix of 640 x 200, 320 x 200, 160 x 100 or 80 x 100 dots per screen. Character output can be 40 characters by 25 lines or 80 characters by 25 lines, all of which are programably selectable.

The machine comes as a keyboard unit housing the CPU, memory, power supply and is priced at $1495. Video display is via an external device which sits on top of the basic unit. A series of display devices are available to suit your budget, ranging from a black and white television set, through colour TVs up to a series of dedicated colour monitors for improved resolution. The top of the range monitor will cost around $1300, but provides excellent graphics. The keyboard unit also contains expansion sockets. Hitachi has cleverly placed most of the standard components under the actual keyboard area to leave a maximum amount of space free in the rear part of the housing. For this reason, the dreaded expansion interface is not required. On-board expansion capability is provided in the form of two memory sockets to increase RAM from the standard 32k up a maximum of 256k. Additionally, six interface sockets are supplied for disk drives and other peripherals not already catered for by the standard configuration.

The Peach with high resolution colour monitor and 5 inch floppies.

As well as the impressive 24k ROM/32k RAM combination, standard hardware includes a real time clock, a 600 baud cassette interface, a Centronics parallel printer port, an RS232 serial interface, sound generator, numeric key pad and an interface for a light pen. The fact that these features are not "tack-ons", but were integrated into the original design means that they are supported in the Basic language. For example, it is possible to define light pen regions on the screen and specify what branching should occur if these areas are activated. Similarly, statements and functions are provided for communicating with the RS232 port, making it a breeze to set up programs to allow a number of Peaches to get together via modems. Also standard are five function keys, providing ten programmable function keys when used in conjunction with the shift. Once again, high level language support is supplied for this facility, making it very easy to program around.

The character set includes all the standard ASCII symbols, including lower case. According to the manual, it also includes "easy-to-read Japanese Hirigana writing". Well. It wasn't easy for *me* to read. I am assured by Delta, the Australian importers of the Peach, that these heiroglyphics can be replaced by a set of symbols more relevant to your application, such as the Greek alphabet or mathematical symbols. In high resolution mode, scrolling takes place at a noticably slow rate. This is because the screen information must be moved up one graphics pixel at a time, not one character position at a time – a side effect of allowing flexible intermixture of graphics and character information on the screen at the same time. In general, considering the speed of the 6809 processor, I was somewhat surprised at the slowness of high resolution video manipulations when performed through Basic. A great deal of powerful high level language support is provided for using the screen, including a line drawing statement with all sorts of options to specify colour, start point and end point or continuation from the last draw, characters to place at the start and end of the line, and even an option to form a rectangle around the end points of the line and colour it in. The colouring-in option takes place quite slowly, even given that it has probably got a lot to think about. I guess if you need really fast high resolution graphics, you can always resort to machine code. One of the most impressive graphics statements the machine supports is the PAINT command, which allows you to create an outline of some shape and then colour it all in a single statement.

One point that Delta keeps stressing is quality. Apparently the Hitachi corporation is fanatical about quality – reputations to protect. The quality of the product is apparent when you first lay hands on it. Reliability is another thing. I am told that the machine is subjected to a seven day burn-in period before it leaves the factory. All I can say

THE PEACH

is that it didn't break down when I was using it, but I think it's safe to trust a company like Hitachi. Delta is being quite choosy as to who will retail the machine, insisting that each distributor has a certain amount of support and training. For the big problems, an Australian service centre is being set up, so there is no worry about having to take your machine back to Japan should a fault occur.

Software

The Basic provided in the 24k ROM includes all the usual Microsoft statements and functions, as well as extensions to support all the extra hardware features found on this machine. Additionally, taking advantage of the ROM size available, Microsoft has included program merge, program renumber and full error diagnostics. In general, the language seems very comprehensive and user friendly. The manual I was given, however, was somewhat of a disappointment, being very unclear, ambiguous and hard to follow. I am told that this was a direct translation from the Japanese version and, of course, it lost a little in the process. Apparently an English version is in the making which will be applicable to people without computer experience.

Peripherals

A printer is available for the Peach which plugs straight into the Centronics port on the basic unit. The printer is a bidirectional Epsom look-alike, selling at $499 (friction feed) or $560 (tractor feed). A range of disk drives are also available with capacities that should meet the storage requirements of most applications. Although I did not have a chance to play with some drives, I did see one in action – but apparently the ones Delta will be importing in volume are quite different. The spectrum of storage devices will start at the low end with single side single density 5¼” drives offering 110k capacity per disk. The next step up is double sided, double density at 360k per disk. The disks can be daisy-chained together for expansion. Additionally, dual double sided, double density 8” drives will be available, giving 2.4 Mb per unit. This capacity should be sufficient for most small business applications, but if you need something larger, Winchester drives of 5.9 Mb or 20Mb are available. No expansion interface is required to support disks, but a disk controller board must be slotted in to one of the expansion sockets at a cost of around $175. Although full pricings were not available at the time of print, I am told that the single sided, single density 5¼” floppy will sell for about $495. So you're looking at about $670 to convert from a non-disk to a disk-based system, and that is very reasonable indeed.

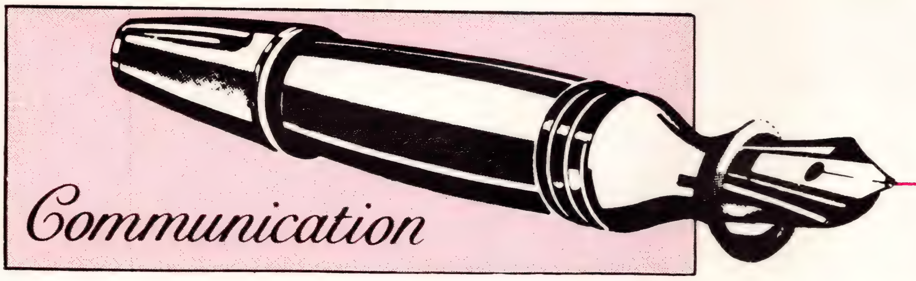
Unfortunately, there is not much software around yet. But Australian software houses are working in a flurry, churning out applications packages by the megabyte. By the time you read this, there should be an extended Visi-calc, a word processor and some sort of financial package (at least). An operating system called “Flex” is also in the pipe-line, and through this will come languages such as Fortran, Pascal and Cobol. I think the next few months should see large amounts of programs being written for the Peach – with the added incentive that we can export them to the American market when the Peach reaches their shores.

Conclusion

All in all, there is not much to say about the Peach at this early stage, except that it is a great machine manufactured by a large company synonomous with quality products and based on some very sound design philosophies. At the time of this review, Delta seemed to be still pretty much in the initial setting-up phase but no doubt things should be a lot more solid by now. We hope to have another look at the machine when peripherals and software are available.

Technical Specifications

CPU	HD6809 (compatible with Motorola MC6809)
RAM	32k standard. On board expansion to 256k.
ROM	24k Microsoft
Languages	Basic in ROM, others coming later.
Disks	5¼ inch floppies up to Winchesters.
Cassette	External recorder required.
Interfaces	RS232 Centronics Light pen
Graphics	8 colours, up to 640 x 200 dot resolution.
Keyboard	87 keys with roll over including numeric pad, cursor control and programmable function keys.



Communication

APC welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add "not for publication" if your letter is to be kept private.

Address letters to 'Communications', Australian Personal Computer, P.O. Box 115, Carlton, Vic. 3053.

I note your TRS-80 machine language program reactivator. You may be interested in my method:

1) POKE 17129,1
2) POKE 16821,195
   POKE 16822,89
   POKE 16823,27
3) SYSTEM <ENTER>, and answer the prompt with /11395

Note that once this has been used, subsequent recoveries only require the first two pokes before the system call.

Rod Worley.

I like the magazine – keep up the masses of news and the articles aimed at a wide range of machines.

It was good to see a dribble of material on the Compucolor. Compucolor owners all over the world have had to establish an information network because of poor manufacturer support – the machine is no longer being produced but few machines would be the subject of so much owner activity.

I will be writing to two addresses gleaned from your magazine. You can if you wish list me as contact in Canberra on Compucolor.

K. Kerrison.
5 Beltana Rd.,
Pialligo.
A.C.T. 2609

My hobby computing days and APC were born about the same time. The road to now has taken me to many rewarding places but has not been without its fair share of rough patches, treacherous uphill climbs and plain deadends.

When one lives out West and away from the 'big smoke' what one needs to keep going is relevant and readable information. I salute and thank APC for giving me just this – not that I have at all times felt so kindly disposed.

There was the frustration of eagerly soaking up articles and programs and then setting out to put my newfound knowledge to work on my Commodore CBM only to find that the author assumed that all your readers ran SNAFU MK7's. Then came those eagerly sought after PET programs at a time when every ROM looked alike until I discovered where to PEEK (sorry!)

The GOSUB Latin Quarter to study backgammon proved to be easy going compared with the many tortuous tracks to the same deadend until I realised one had to build bridges of code to replace those swept away when a PET printer had been overstressed while LISTING the way. Building a sound box to eavesdrop on the Aliens Attack seemed a clever thing to do but alas, forewarned, they outsmarted us all by dispatching gremlins to deal with our sound deciphering codes.

At first I eagerly awaited the BLUDNERS page but you knew what was best for me and so it was back to analysis and understanding – although I will wager that my wife and a few other wives would dispute the point. Finally I felt I had arrived even though I occasionally needed powerful lighting and a glass to see my way. It was then you produced your masterstroke, the vanishing listing, and I knew it was time to give in and ask for help.

All things considered you have found a happy combination and it has been great having you along and I hope you will be there offering guidance for a long time yet.

Congratulations.

EL,
Bunbury, WA.

Our production people feel they have conquered the so-called "vanishing listing" problem using a new photographic technique (they photocopy poor quality listings!) to greatly enhance the contrast of listings and ensure readability in the finished printed magazine.

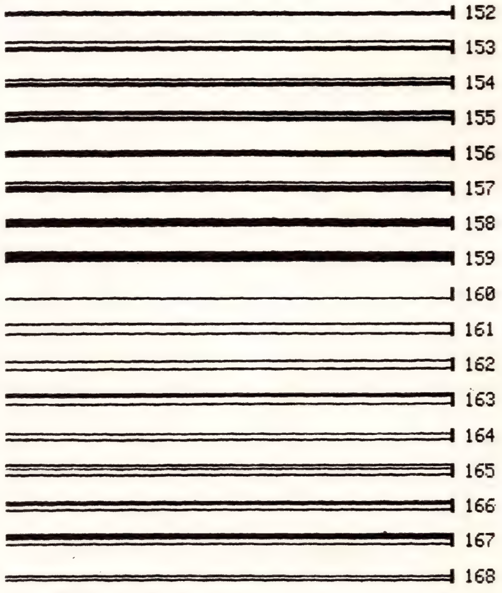
Again could we ask readers submitting programs to ensure their printer is producing a clear listing for the sake of other readers' eye strain.

I have enclosed a copy of a small program I have written. Hopefully it will be of use to many people wishing to make use of their printers graphic ability but not knowing how to go about it.

I've also enclosed a sample printout to show what the program can do.

C.H.Green.

```
8 CLS
10 PRINTTAB(10)"PROGRAM BY CLIFF GREEN (NEW ZEALAND)"
12 FOR X=1 TO 1000 :NEXT X
20 PRINT:PRINT:PRINT
40 PRINT"THIS PROGRAM PRINTS OUT A FULL LISTING OF GRAPHIC PRINTER       CHARACT
ERS AND CODE NUMBERS, NOTE THERE IS 253 OF ONE  CHARACTER IN A LINE ENDING WITH
2 FULL HEIGHT CHARACTERS TO SHOW THE      RELATIVE HEIGHT POSITIONS OF THE DOTS.
"
41 PRINT" MOST COMPUTERS USING A DICK SMITH GP-80 GRAPHIC PRINTER OR     SIMILAR
 SHOULD GIVE THE OPERATER USING THIS PROGRAM AN ESSENTIAL LIST OF DATA."
42 PRINT"LINE 46 PUTS THE PRINTER INTO GRAPHIC MODE, TO RETURN  TO         STANDA
RD PRINTING ENTER LPRINTCHR$(15) AND FOR DOUBLE SIZE      LETTERS ENTER LPRINTCH
R$(14)."
43 PRINT"LINE 50 TELLS THE PRINTER TO PRINT A STRING OF CHARACTERS (28)  THE NUM
BER OF CHARACTERS IN THE STRING (253) AND THE (E) STATES  WHICH CODE NUBER IS RE
QUIRED."
45 FOR E=128 TO 255
46 LPRINTCHR$(8)
50 LPRINTCHR$(28);CHR$(253);CHR$(E);CHR$(255);CHR$(255);CHR$(15);E
52 NEXT E
```



I have enclosed a program called escape key stop. The program is to enable the user to:

1) Stop a listing.
2) Stop the printed output from a program.
3) Stop a graphics program from running.

The program is fully relocatable and there's a section at the end which is used for resting the 'CTRL C' vector. Setting up pointers for other routines can easily be accomplished.

J. Lindsay.

SUPERBOARD II

```
10   PRINT 'ESCAPE KEY STOP.'
20   PRINT 'FOR NORMAL SYSTEMS.'
30   PRINT 'BY J.S.LINDSAY.'
40   FORA=546T0569
50   READB
60   POKEA,B
70   NEXT
80   DATA32,155,255,173,12,223,201,254,208,246,96
90   DATA169,34,141,28,2,169,2,141,29,2,76,116.162
100  POKE1,45:POKE2,2
110  NEW:POKE11,0:POKE12,0:X=USR(Y)
```

Help!

To cope with the increasing number of programs being received at our offices, we're after a small team of people, each with intimate knowledge of a particular micro to assess material for publication. Interested people should phone (03) 818 1488 during office hours to make arrangements.

BENCH TEST

TRS-80 COLOR COMPUTER

On December 11, APC attended the Australian launch of the TRS-80 Color Computer at Tandy's Rydalmere head office. Steve Withers conducts the benchtest.

The TRS-80 Color Computer represents a major departure from Radio Shack traditions. First, although the 'TRS-80' trademark is still used, the processor is the Motorola 6809. Second it can be used with plug-in ROM packs. Third, it offers high-resolution (256 by 192) colour graphics.

The cheapest Color Computer comes with 4k of memory which can be increased to 16k. The only significant option is 'Extended Color Basic' which provides additional functions, including access to the high-resolution graphics, but requires the extra RAM.

Hardware

Housed in a plastic case in the now-familiar silver and black colour scheme, the Color Computer measures 15in wide by 14in deep, and is 3¾in high.

The single printed circuit board is half the size of the case, and about one third of it is taken up by the power supply. The majority of the digital components are housed in a metal can, presumably to eliminate RF interference. The use of advanced components results in a surprisingly small chip count. Apart from the 6809 processor, there is a 6883 synchronous address multiplexer which generates the necessary timing signals and refreshes the dynamic memory. Two chips dealing with the video output, a pair of peripheral interface adaptors, the ROMs containing the firmware, and that's about it. Outside the can there are some more components, but the overall impression is of a remarkably small number of ICs to achieve so much.

Like the Sorcerer, the Color Computer makes use of ROM packs which plug into a socket on the right-hand side of the case. These 'Program Paks' get control of the system when they are present at power-on; otherwise, the resident Basic interpreter is used.

The keyboard is unfortunately of the calculator type — although the spacing approximates that of a typewriter, the keys are 'clicky' and require more pressure than normal, and although the keytops are curved, they are not dished, adding to the lack of 'feel'. While it is better than the original PET keyboard, it is not really suitable for entering large amounts of text, though if you accept the premise that this computer is intended for domestic use, then the keyboard is adequate.

The video display is controlled by the remarkably powerful MC6847 IC. In text mode it provides 16 lines of 32 characters, which isn't enough for word processing, and is no more than adequate when programming, but it is very clear and completely legible at normal viewing distances. The display is normally black on a green background but can be changed to red on yellow within a program. Both combinations can be reversed, although the expected green on black appeared as green on dark green. Whenever a Basic program calls for input, or the system returns to the command mode, the display returns to normal.

As well as the upper case character set (lower case is shown by inverse video) the internal character generator produces 128 graphics characters. These characters give a resolution of 64 by 32 (ie, two by two in each character position) but each may be displayed in any one of eight colours — green, yellow, blue, red, buff, cyan, magenta, and orange. These characters all have a black background, so nothing really fancy is possible.

This limitation is insignificant, because a variety of graphics modes are available. The maximum resolution available is 256 by 192 and up to four colours are available. Unfortunately, there is a trade-off between memory consumption, resolution and colour choice, as Table 1 shows.

Grid Size	Colour Choice	Pages Used
256 by 192	2	4
128 by 192	4	4
128 by 192	2	2
128 by 96	4	2
128 by 96	2	1

Table 1

Each page of graphics memory consumes 1.5k of RAM and it is possible to reserve sufficient memory for eight pages. Simple arithmetic shows that if all eight pages are used there is not much memory left for a Basic program and its variables — 2.5k, in fact, since memory is also needed for the text display and for system use. More than one screenful may be used, providing the page limit is not exceeded. This has exciting implications for simple animation, since the switch from one screenful to another is instantaneous.

Graphics coordinates are specified in terms of the finest grid, regardless of the resolution selected, so the bottom right-hand corner of the display is always (256,192). My initial reaction was that this was rather odd, but it has the advantage that if you decide to use a higher resolution than originally planned, there is no need to change all the plotting statements.

All eight colours listed above are available in the graphics modes, but not all at once. In two-colour modes the choice is between black/green and black/buff. The two four-colour sets are green/yellow/blue/red and buff/cyan/magenta/orange. At first I was disappointed by this restriction but the games programs show what can be done given sufficient imagination.

A feature of this computer is that audio information is added to the TV signal. Sounds may be generated by the computer, or they may come from the optional cassette recorder also used for program and data storage. This would allow spoken instructions to be recorded after the program, for instance. Speech synthesis of a sort is possible by careful use of the hardware but the skiing game's generation of the starter's voice is unintelligible unless you have read the manual and know what the words are.

The cassette interface transfers data and programs at 1500 baud. Motor control is provided and the whole thing worked reliably, although I found it was necessary to erase tapes before re-using them. This is probably due to the relatively high speed and short file headers used.

Although the two joysticks are optional extras, their interfaces are standard equipment. The joysticks return values between 0 and 63 in each direction and are also fitted with push-buttons.

The final interface provided is an RS232 serial port, intended primarily for use with a printer. A single hand-shaking line is provided, notionally Carrier Detect, but it could be connected to any appropriate signal. If the external device does not support hand-shaking Carrier Detect must be held 'high'. The firmware supports baud rates between 120 and 2400. Although the circuit provides for input as well as output, insufficient information is provided to permit the use of the port for input. In the US a Program Pak is available to turn the computer into a terminal for use with one of the dial-up networks operated by timesharing bureaux, although this requires a modem. This is no great strain on the pocket, since the Radio Shack modem sells for just $US149!

All connections are made at the back of the case, as are the on/off and reset buttons. The variety of sockets used makes it impossible to go wrong when connecting the system.

If anyone is particularly interested in the details of the Color Computer's workings, *Byte* carried a detailed article about the machine, 'What's inside Radio Shack's Color Computer?', by Tim Ahrens, Jack Browne, and Hunter Scales, March 1981, pages 90-130). I strongly recommend this article to anyone considering the purchase of a Color Computer, as it contains much useful information, such as instructions for increasing the internal memory to 32k, and how to use the expansion port. In fact, if I hadn't read it I wouldn't have known that there was an expansion port, as the manuals only describe its use as the Program Pak socket.

Software

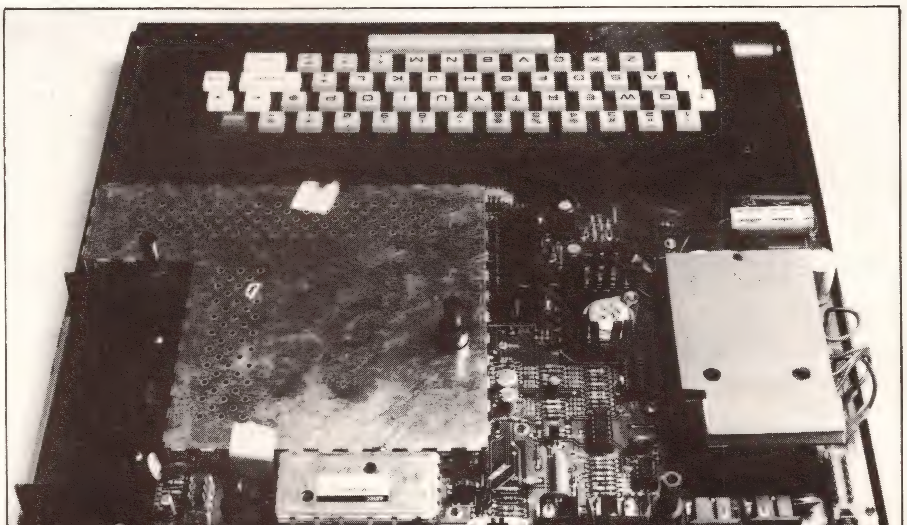
As the list of keywords shows, Extended Color Basic has a lot in common with other Basics written by Microsoft. Numeric variables, for instance, are restricted to values between plus and minus 10^{38}, and offer nine significant digits. Line editing is provided and a useful feature of the editor is that the line is listed automatically before editing starts.

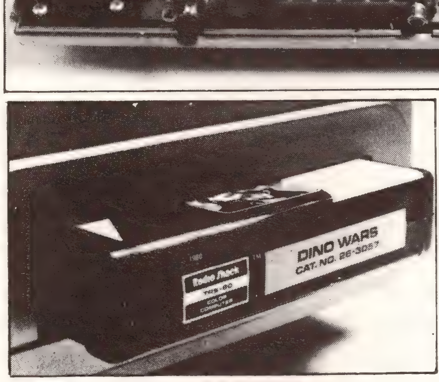
Although it is not the slowest system tested by APC, the Benchmark timings were particularly disappointing in view of the use of the 6809 processor. My guess is that this is a result of the low clock speed (0.895 MHz) rather than a fundamental weakness in the software. The *Byte* article includes a 'magic poke' to double the speed (except during cassette and other external I/O operations) but I cannot confirm its effect as I read about it after returning the test machine.

What is more important with a computer of this type is how well the hardware features are supported by the interpreter, and in my opinion the graphics functions are very powerful. I have never encountered such sophisticated graphics in a low-priced system. The lowest level of command simply turns a cell on or off but the more advanced features came as a real surprise.

The LINE command (as you would expect) draws lines between two specified points, or if only one pair of coordinates is specified, between that point and the previous endpoint. By using the options provided, it is also possible to erase a line (ie, draw it in the background colour) or to draw a rectangle, treating the endpoints as diagonally opposite corners. If desired, the rectancle can be filled in with the foreground colour.

I won't spell out the function of CIRCLE, but it is also capable of drawing arcs and ellipses! Both LINE





and CIRCLE permit the specification of a colour code.

To produce more complex shapes, DRAW is used. This command takes a string parameter which specifies the shape to be drawn. Movement may be to a stated coordinate or relative to the current position. 'Turtle'-like motion is also possible, but limited to eight directions. Additional flexibility is given by the ability to rotate or scale the shape, change colour, to move without drawing and to draw a line without updating the 'current' position. To increase the flexibility, the string may contain a reference to another one. This has a similar effect to GOSUB in a Basic program.

Once an outline is produced, there is no need to laboriously colour it in a dot or line at a time — simply PAINT it. This is used by specifying a starting point, the colour of the outline and the colour to be used. An invisible brush then does the work but not instantaneously — it takes about seven seconds to colour the whole screen.

Things now start to get very interesting for budding Walt Disneys. If you remember, it is possible to use several separate screenfuls of graphics. A single command copies the contents of one screen to another, which means that a static background only needs drawing once. Add the details to each 'frame' in turn, then flip from one to the next and you have an effective (but short) animated cartoon. Things could be made more complicated by replacing the delay loop that is needed between frames with the code to change the previous frame, but having only 16k of memory would preclude anything really fancy.

Technical specification

CPU	6809E, 0.895 MHz.
RAM	16k dynamic, 4116 type.
ROM	16k (8k without Extended Color Basic)
Disks	available later
Cassette	1, software controlled, 1500 Baud
Serial Port	1, RS232 (simplified)
Screen	16 lines of 32 characters, uses colour TV.
Keyboard	53 keys
Languages	Extended Color Basic or Color Basic

Basic Keywords

ABS	AND	ASC	ATN	AUDIO	CHRS
CIRCLE	CLEAR	CLOAD	CLOADM	CLOSE	CLS
COLOR	CONT	COS	CSAVE	DATA	DEF FN
DEF USR	DEL	DIM	DLOAD	DRAW	EDIT
ELSE	END	EOF	EXEC	EXP	FIX
FOR	GET	GOSUB	GOTO	HEX$	IF
INKEY$	INPUT	INSTR	INT	JOYSTK	LEFTS
LEN	LET	LINE	LIST	LLIST	LOG
MEM	MIDS	MOTOR	NEW	NEXT	NOT
OFF	ON	OPEN	PAINT	PCLEAR	PCLS
PCOPY	PEEK	PLAY	PMODE	POINT	POKE
POS	PPOINT	PRESET	PRINT	PRINT#	PRINT@
PRINT TAB		PRINT USING		PSET	PUT
READ	REM	RENUM	RESET	RESTORE	RETURN
RIGHT$	RND	RUN	SCREEN	SET	SGN
SKIPF	SIN	SOUND	STRING$	STR$	SQR
TAN	TIMER	TROFF	TRON	USRn	VAL
VARPTR					

Another approach to animation makes use of the GET and PUT functions. GET copies a portion of a graphics screen into an array, and PUT replaces it, possibly in a different position. Once a block has been stored in an array, successive PUTs may be used to make the shape appear to be moving around the screen. When PUTting an array onto the screen it is possible to AND or OR the array with the current contents of the screen area. Other options allow the reversal of the array contents (ie, points that are set in the array are reset on the screen, and vice versa). If NOT is used, the contents of the array are ignored and the screen area is reversed. The lack of memory becomes a problem when using GET and PUT, as each pixel is stored in a separate element of the array. This means that a block measuring 50 by 50 would consume about 10k of RAM! The manual suggests 1400 elements as a practical limit in a 16k system but if four pages of graphics memory were being used, there would not be room for much of a program.

Sounds (some people might say noises) may be added to a program by means of the PLAY command. Like DRAW, this is followed by a string literal or variable, which holds a series of codes to specify the desired sequence. To keep things simple, the letters 'A' to 'G' represent the notes of the same names, with '#' suffixed to indicate sharps, and '—' for flats. An alternative notation represents the scale from C to B by the numbers 1 to 12.

This easily-memorised notation extends to the length of notes ('L'), the octave to be used ('O'), volume ('V'), tempo ('T') and pauses ('P'). These instructions are all followed by integers representing the 'amount'. For example 'L1' specifies whole notes, 'L2' half notes and 'O3' the third octave. Dotted notes may be entered by placing a full stop after the length number.

New values for the octave, volume, length, and tempo may be defined relative to their current values. The symbols '+—><' increment, decrement, double, and halve the value respectively. I had some fun playing with this feature.

Other hardware features are supported by appropriate commands and functions. The cassette recorder is controlled by MOTOR ON/OFF and AUDIO ON/OFF and, in addition to program and data files, it is possible to save and load memory-image files. Filenames of up to eight characters may be used, and SKIPF 'filename' advances the tape to the end of the specified file. although this is not usually necessary since CLOAD and OPEN search for the specified file. Unfortunately it is not possible to verify that a program has been saved correctly.

Other functions are JOYSTK (to obtain the position of a joystick), TIMER (which counts to 65535 in 1/60ths of a second), SOUND (generates a tone given the pitch and duration) and SET and RESET (to control the graphics blocks available on the text screen).

Useful facilities not found on all systems include program tracing, decimal to hex conversion and line renumbering.

Unless the computer was only intended for use with Program Paks, I would strongly advise the purchase of a system with Extended Color Basic, since the 'cooking' version of the interpreter does not allow the use of high resolution graphics, and PLAY and several other nice things are missing. Equally, a 16k system is essential for Extended Basic and it is needed in order to get the best from some of the Program Paks.

Program Paks

Although I have not seen a full list of available Program Paks, the dozen provided are probably representative of the range. The target is clearly the home market — games predominate, but there are a couple of practical and educational programs.

Few of the games are unusual but they make good use of the graphics facilities. 'Quasar Commander' is a three-dimensional Star Wars style game which is made more difficult by the imposition of a time limit. The 3D animated graphics produced by 'Skiing' provide a good demonstration of the machine's potential in this area.

For sheer entertainment, my favourites were 'Pinball' (design your own table if you wish), and 'Dinowars'. This is a ludicrous game for two players, each using a joystick to control a Tyrannosaurus Rex, the object being to bite your opponent's beast on the back of the neck. Throw in a few cacti as obstacles and some blood-curdling roars and great fun will be had by all. It would be even better if the front-to-back resolution could be improved to make it easier to judge if your dinosaur is right behind your opponent's.

The quality of the keyboard makes 'Typing Tutor' difficult to assess. A better keyboard would make touch-typing easier but typing various permutations of 'ASDF' until your speed approaches a target soon becomes tedious. I suppose it depends how well motivated you are, but I doubt that commercial typing courses are quite as boring.

'Personal Finance' allows its user to prepare a month-by-month budget and to enter actual payments. The program provides for more than one bank account and data is stored on tape between runs. The screen formatting is good and it is possible to re-define expense categories to suit your pattern of spending. A sign of the times is the presence of 'Alimony' as a heading.

If the Color Computer starts misbehaving, simply plug in the 'Diagnostics' pack, which checks memory, video and other aspects of the machine. It could be worth using regularly to ensure peace of mind but if you are going to pay to have the machine repaired, why bother?

Documentation

Two manuals were supplied with the Color Computer. The Operation Manual is a clear, easy-to-follow guide to connecting the various parts of the system and what to do if it fails to work properly.

'Going Ahead With Extended Color Basic' is intended as a sequel to the introductory 'Getting Started With Color Basic'.

Benchmarks
(All times in seconds)

1	2.0
2	11.5
3	22.2
4	23.9
5	27.0
6	41.5
7	61.1
8	13.0

Memory map

```
-------------------------FFFF
          I/O
-------------------------FEFF
        Program
        Pak ROM
-------------------------BFFF
         Color
       Basic ROM

-------------------------9FFF
        Extended
      Color Basic
          ROM
-------------------------8000
.                        .
.                        .
-------------------------3FFF
      Program and
        variable
        storage
-------------------------35FF



        Up to 8
        pages of
        graphics
         screen
          RAM

------------------------ 05FF
      Text screen
          RAM
------------------------ 03FF
         System
          RAM
------------------------ 0000
```

'Going Ahead. . .' is written in the usual light-hearted Tandy style. It is a tutorial book, containing plenty of examples, quizzes and programming tasks with model solutions. It's not the sort of thing you would give a professional programmer but just right for exploring the powerful (but not always simple) features of the language. To encourage the new user, there are some photographs (Color, of course) of displays which can be produced with the machine.

For the more experienced, appendices provide a summary of the Basic keywords, various tables (eg, ASCII codes), and instructions for using the I/O routines from machine code programs and for connecting non-standard printers.

A quick reference card is normally supplied. This would be very useful to prevent the manual becoming rapidly dog-eared.

Overall, the documentation is very well written, providing all the necessary information in a readable form, but the booklets supplied with the Program Paks are another story. I am not convinced that printed instructions are necessary for relatively simple programs (what's wrong with the screen?) but in any case they were not written as fluently as the major manuals. For example, in 'Typing Tutor' the pupil must plough through several pages of instructions before discovering that it is possible to change the 'pass level' which controls the progression to other keys.

Expansion

Apart from the conversion to Extended Color Basic and 16k of memory, no 'official' expansion is possible. As previously mentioned, it is possible to add a further 16k within the case of the Color Computer and a printer or other RS232 device could be attached. Four disk drives can be connected to the TRS-80 giving a total on-line storage capacity of 626k (156.6k per disk). The drives are 5¼ inch double-density and require a plug-in ROM cartridge which contains the Disk Operating System so that the full 156k is available even on the first drive.

It seems likely that other manufacturers will produce accessories and other products (including software) for the Color Computer in the same way as they have for other Tandy machines.

Potential

There can be little doubt that the Color Computer will be mainly used at home, being clearly aimed at the super video game market. However, it could find a niche in two other fields. Given suitable software plus some expansion, it has great potential in education as a visual aid, rather than as a computer proper — a poor man's PLATO, if you wish. But please, think before you buy for this purpose, as such software is not easy to produce, despite the power of Extended Color Basic. I also believe it could be purchased for use as a cheap colour graphics terminal. A Tektronix emulator Program Pak is likely to sell very well.

Conclusion

Given its reasonable price, the Color Computer seems destined to be another success for Tandy.

The CBM VIC and Atari computers will prove formidable competition but the Color Computer should hold its own. The machine works and, within its limitations, anyone interested in graphics should have fun using it. The TRS-80 Color Computer is expected to be on sale by the time you read this review.

Prices

Color Computer, 4k RAM	$599
Color Computer, Extended Color Basic, 16k RAM	$849
32k RAM upgrade kit	$249
CTR-80A Cassette Recorder	$69
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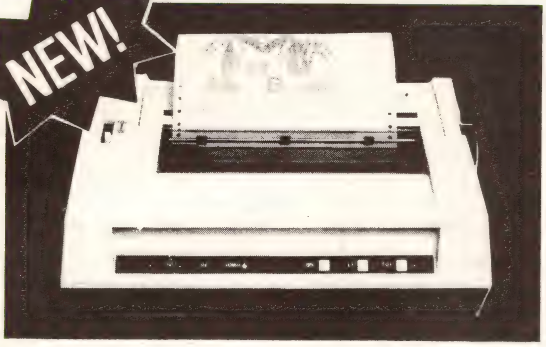

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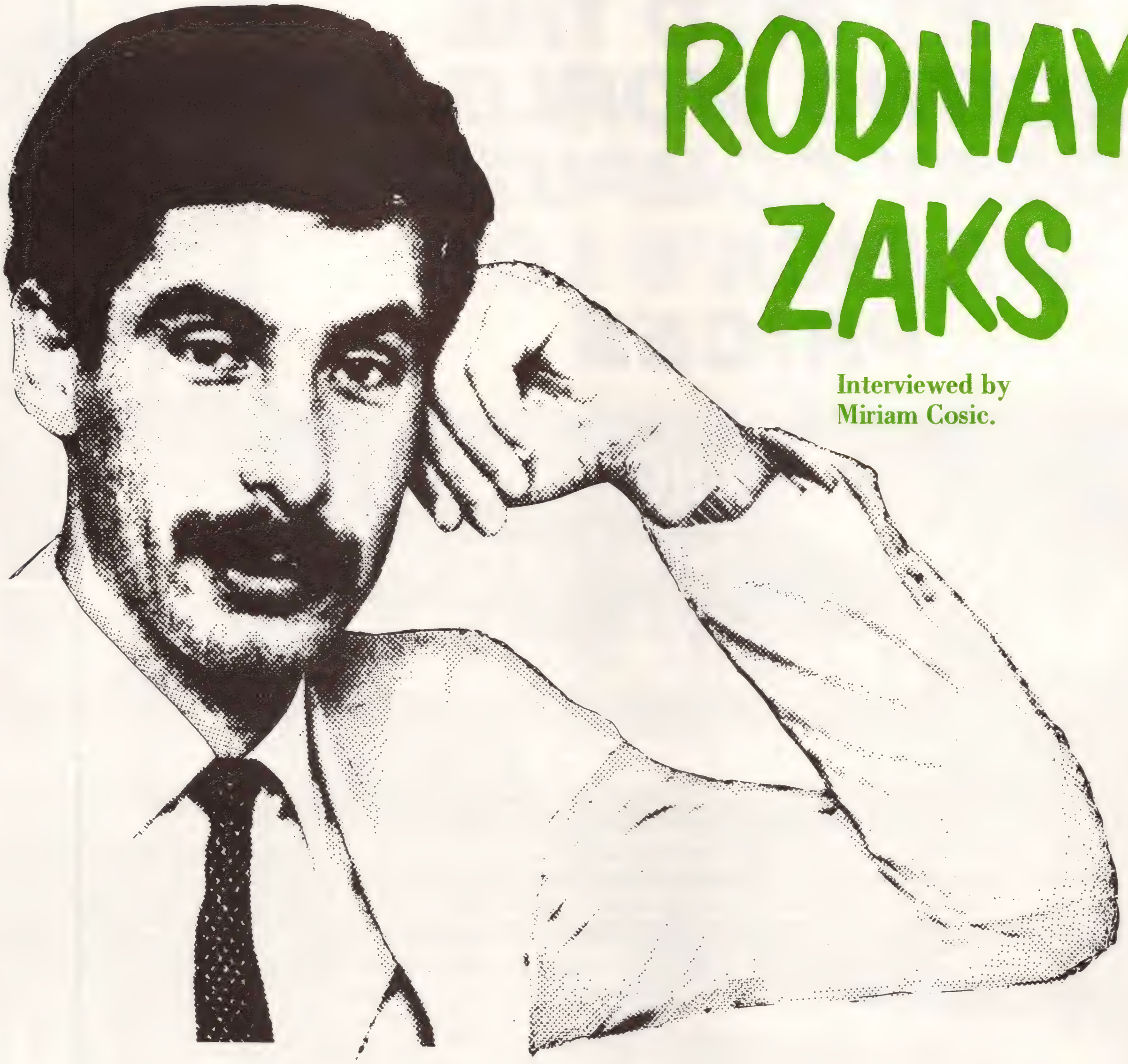

RODNAY ZAKS

Interviewed by
Miriam Cosic.

Dr Rodnay Zaks spent a day in Sydney recently to confer with ANZ Books, Australian distributor of his Sybex books on microcomputers. An authority on the micro industry, the man has a curious bend of self-confidence and diffidence: the former surfacing in his professional performance, the latter in his social style which is an attractive mix of French *savoir-faire* and American Apple Pie.

As well as writing several books a year, managing Sybex, lecturing around the world, consulting to various government and professional bodies and contributing to computer publications across four continents, he also manages to include skiing, running and scuba-diving among his personal interests.

Dr Zaks was born in Paris in 1946, and lived there until 1967, by which time, aged 21, he had received an engineering degree from the "Ecole Centrale des Arts et Manufactures" and a university doctorate. Interested in computers, he went to the University of California, Berkeley, receiving an M.Sc. the following year and a Ph.D by 1972.

From 1968, he worked in computer research and development. His initial involvement was with Project Genie, at Berkeley, where one of the first time sharing systems was developed. He pointed out that such was the enthusiasm generated there, that many of the people who founded what are now the major companies in the US were associated with the project.

After working as project leader for the development of a multiprocessor microprogrammed APL system, he joined Singer/Link in Silicon Valley. There, Dr Zaks designed the first microcomputer-based urban traffic control network in the US. He published some of the earliest papers on industrial uses of the Intel 4004, the first available microprocessor.

According to Dr Zaks, at that time only the few people who had a combination of hardware and software knowledge saw the potential of microcomputers. They understood that only the interaction of software and hardware was limiting application, and with this understanding could make designs cost effective and industrially useable.

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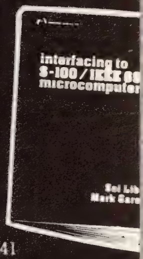

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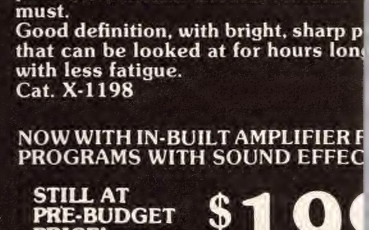

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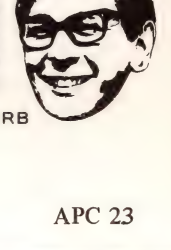

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RODNAY ZAKS

By this time he was lecturing internationally on the design and use of microprocessors. In 1973, while serving as a director of SIG MICRO, the ACM scientific organisation, Dr Zaks founded Euromicro, a non-profit organisation dedicated to the advancement of science and technology in the field of microprocessing.

Dr Zaks thinks that the combination of his own technical and entrepreneurial abilities with the mentality which existed in California at the time, made the time and place right for the launch of his company. Realising that his lecturing was effective, he launched Sybex in Europe and the US in 1976. Its original products were seminars and training sessions providing microcomputer education to a technical and engineering audience.

Sybex became a publisher by accident. The main complaint at the seminars was the lack of documentation. So Rodnay wrote *Microprocessors,* with 5,000 copies to be given away at the sessions. Having a product on his hands, he decided to put it up for general sale. It sold out in ten days. His second book, *Micro Interfacing Techniques,* did equally well. It became apparent that he was writing books of significant demand, and within a few years publishing became the dominant business of his company.

According to Dr Zaks, the fact that all the people involved are computer-oriented (no one comes from publishing) has been very important to the growth of Sybex. He said that the primary source of their success is the sub-culture of microcomputer buffs, who can identify with Sybex because it understands them. The company can anticipate the needs of its audience.

Dr Zaks drew a parallel between the micro subculture which exists now with the Hippie movement of the late sixties, which he was in the midst of in California. Both groups have been identifiable within society, with a vocabulary and lifestyle peculiar to themselves, groups generated by ideas with an intellectual enthusiasm limited only by imagination and bonded by an us-versus-them attitude to the rest of the world. The most exciting aspects of both movements have been the intellectual ferment and radical forward thinking accompanying the commitment to theory.

Unlike traditional publishing, with its machine gun production philosophy, each Svbex book answers a specific need. Dr Zak claims that the public have come to trust the brand name and the consistent approach to education. Some books have sold over 100,000 copies, and the Micro Dictionary took one million orders in the first weeks. He expects many of the new titles, including word processing and introductory texts, to achieve similar results.

Sybex has been well distributed in Australia for only six months. The books are heavily marketed in Europe and dominate the field. There are sales offices in Paris and Dusseldorf, as well as in California. While the American market is bigger and more heavily star-studded, Dr Zaks said that Sybex is competing well in the US.

There are now 100 Sybex staff members. They have the most technically advanced book production facilities and, of course, they are fully computerised. All available micros are connected into the system to test progams. Authors submit their material on diskettes, nothing is received in paper form, and word processing programs tested for accuracy in spelling and such. Copy is then automatically translated to phototypesetting, guaranteeing accurate program listings.

"Home computers are reaching everyone in the US", Dr Zaks said. "If people don't have a machine, they're talking about them." The breakthrough has been massive, he said, with people now seeing the purchase of a micro as a choice to be made in the same way they used to view buying a television. Where computer literacy is not high enough and the technology gap still inspires fear, Sybex tries to form a link between the hardware and the market.

Asked about the thrust of the micro market, Dr Zaks replied that, although it shifts all the time, the largest growth is currently in the business and professional areas.

He believes that the IBM has had a major impact on the US market. Although it is totally unattractive, there is little software as yet, it will nonetheless be an immense success because people trust the name. He sees the scale of presently unusable hardware leading to fantastic software within six months.

Japanese machines have had no success in the US because they have not represented a price breakthrough. He said that people buy personal computers for emotional reasons and, while many machines have comparable features the most popular name sells. The Japanese will not compete until they have a very sophisticated computer at a very cheap price.

According to Dr Zaks, the delay in interest in micros in Australia is due to the high prices and the lack of widespread information. But the positive side of the time lag is that when the real boom does hit high-quality software will be available for the new machines.

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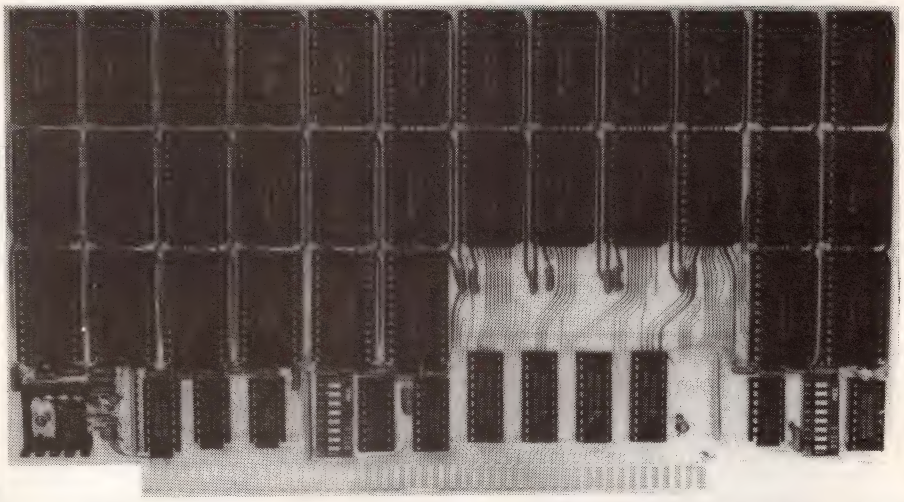

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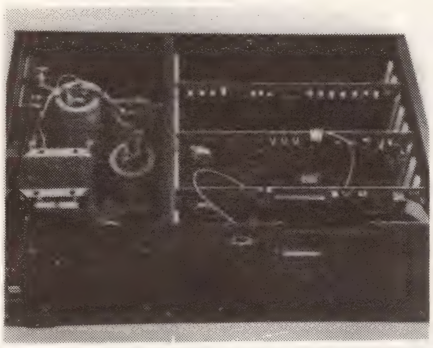

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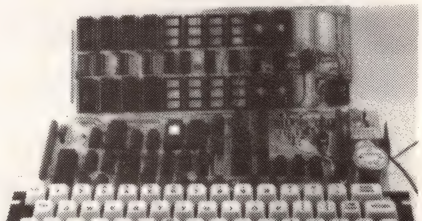

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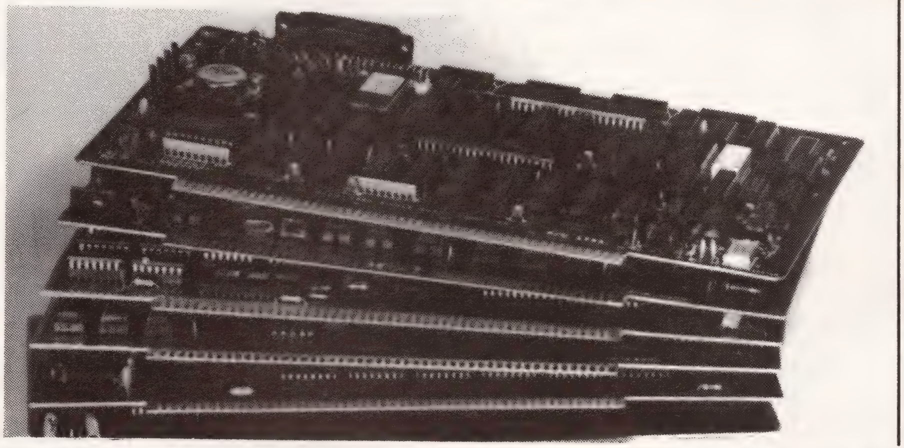

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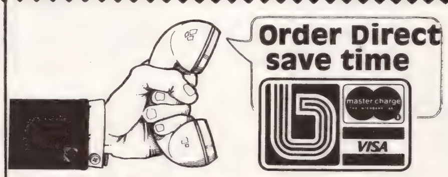

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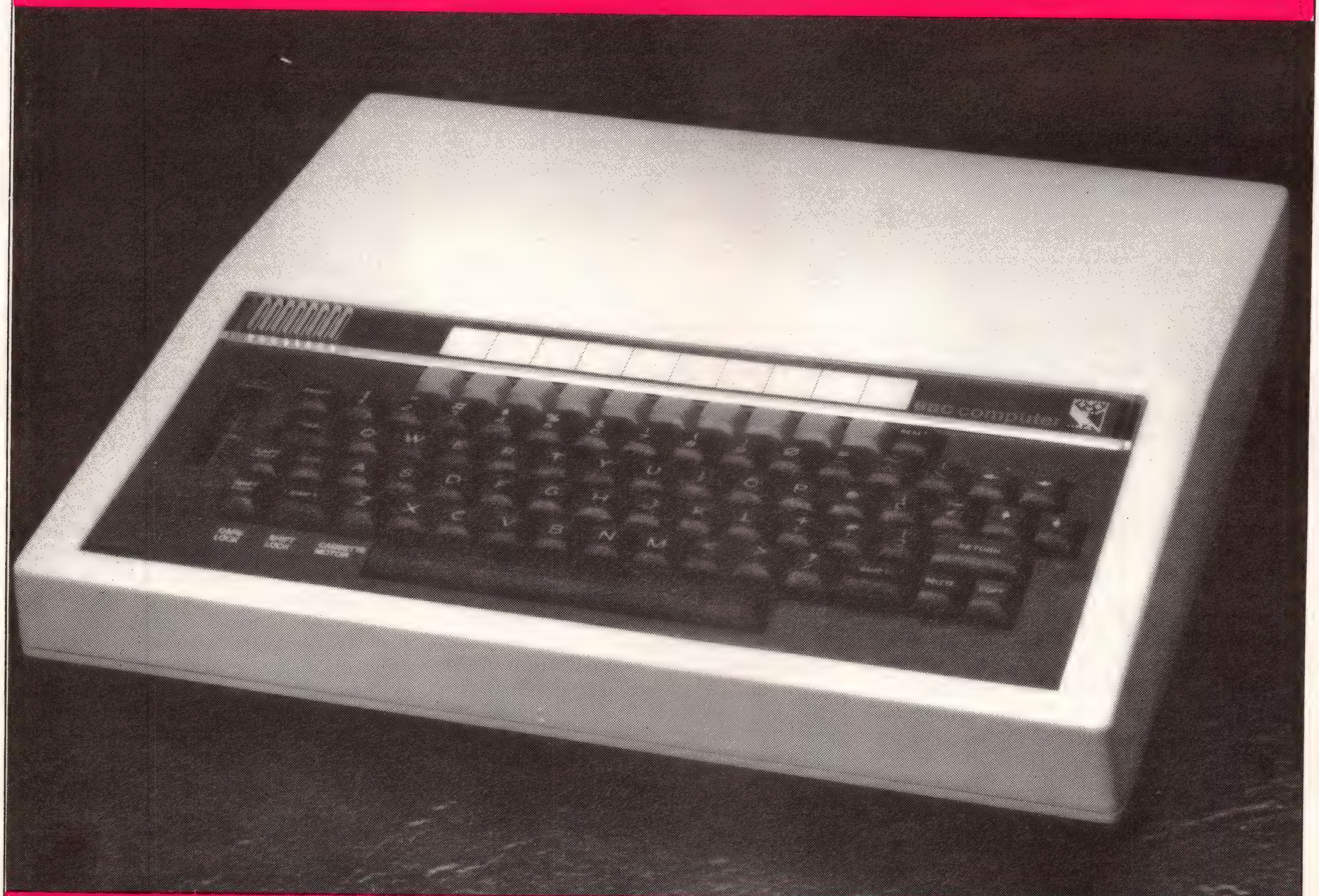

The BBC Micro is the result of BBC Enterprises' decision to produce a microcomputer to be used in conjunction with their forthcoming series on micro programming.
After much controversy – the arguments over processor, language and manufacturer – Acorn was commissioned to produce the BBC Micro. APC reviews the results.

What's inside it?

Inside the BBC Micro (for around $1000) 16 kbytes of user memory, 32 kbytes of permanent software (expandable to 80 kbytes), one of the most powerful graphics systems around on a special chip, and something called the Tube, which allows it to 'drive' a second computer. And there is a standard 6502 micro to handle the Basic and operating system.

Also included in the std. price are analogue inputs, four of them, so that you can plug in four games paddles. And they will be a lot more accurate than any other games paddles, because this machine reads them to 12 binary places, rather than eight – 16 times more precise, in fact. That compares with only one paddle on the Commodore VIC, by the way, or with eight on the Atari 400.

By February or March, you will be able to buy a dual disk unit for under $1000, including interface and operating system, a network connection for $200 and an add-on Z80-based processor, for around $800 – but that's a guess.

The bog standard BBC Micro will display its data, like the VIC and Atari and several other machines, on a standard Australian colour television. It will store its data on an ordinary audio cassette.

It can talk to other BBC Micros down its audio cassette interface and, with a little work, it will be able to load programs and data produced by other machines such as the Tandy. In many cases it will run them, too.

The heart of the machine is that 32k bytes of RAM, with Basic and other routines in it, including a powerful machine-code assembler. The Basic will accept most programs written for popular micros that use Microsoft Basic but it has few of the limitations of normal 8k Microsoft Basic and it allows some features of what professional programmers call structured programming.

For instance, there are procedures which can be performed, there is a REPEAT . . . . UNTIL instruction, and several others which make a program easier to understand when you're trying to fix it. And the variables can be any number of characters long, not just two. Other new features, which aren't available on other Basics, include the fascinating ability of EVALuate an input string – as in INPUT A$; EVAL A$ – and A$ can be a user input formula such as Y=X∧2–3X+6 (similar to EXEC in APC-80. Ref. APC Vol.1 No.9 page 35).

Running somebody else's Basic, however, involves more than obeying the same commands. There is also the question of how many characters there are on the screen; on the BBC machine the answer is, take your pick.

The BBC machine has *eight* graphics modes. Mode 0 gives 32 lines of 80 characters text or 840x256 resolution graphics in two colours. Mode 1 gives 40x32 text or 320x256 graphics in four colours and Mode 2 gives 20x32 text with 160x256 graphics in 16 colours. The snag with these three modes is that they each take up 20k of RAM, leaving just 12k for your program on a fully-expanded system. The other modes, with their memory requirements, are: Mode 3: 80x25 text in two colours (16k); Mode 4: 40x32 text, 320x256 graphics, two colours (10k); Mode 5: 20x32 text, 160x256 graphics, four colours (10k); Mode 6: 40x25 text, two colours (8k); and Mode 7: 40x25 teletext compatible (1k). At power-on, the machine is automatically in Mode 7.

The screen can look like just about any other well-known micro on the market. It can have (in Mode 4, for instance) most of the characteristics of the Apple II. Or it can have something incredible like the VIC, in mode 5, even to the full fat characters, and only 20 across the screen, too. You pick the mode you want out of eight options, and you use the PRINT instructions from the software you want, and it should make the screen look right – as long as you go to the bother of programming the right graphics characters.

Programming special characters is another option. This means that not only can the PET graphics be reproduced, but also special characters of your own. Two or more of these special characters can be joined together, next to or on top of each other, to make a new, larger character – and this can be moved around the screen as a unit.

All these clever colour graphics are handled by a special chip, built for Acorn by Ferranti. It is the same type of uncommitted logic array (ULA) chip used in Sinclair's ZX81, to replace a dozen or so logic chips. Here it performs totally different functions because it is committed in a different way. And there is another ULA on the board, to perform the function of serial communications – normally, driving the tape cassette interface, but also providing the standard computer input and output plug known as RS232. In fact, this one is RS423, which is better; it will drive a wire 4000ft long rather than only 50 feet and it is cleverer at changing the transmission speeds. But it will pretend to be an ordinary RS232 if you like.

The graphics are truly incredible. The full resolution of which the BBC machine is capable won't show on an ordinary television set – the lines are too fine for the TV tuner to pick up; you would need a special colour monitor, which Julian Barson of Consolidated Marketing (the Australian distributors of the machine) hopes to sell for $800. Even at the lower levels of detail, the plotting and drawing options are incredible – there are 90-odd such options – allowing you to draw lines, circles, and other shapes.

To illustrate just one, there is the 'fill' option which draws blocks of colour. After the programmer has specified two points on the graphics screen, PLOT 85 (the 85th option) and two more co-ordinates, x and y, will cause the machine to draw a triangle from the first two as the base line, to the third. Specify another co-ordinate, and a second triangle, using the side of the first as base, turns your triangle into a quadrilateral, or folds back on itself. And this plot can be in any colour. It can also be a colour 'logically' combined with the background over which the triangle is drawn – OR, exclusive "OR" or "AND" with the background colour code.

It isn't necessary to use the screen for text only, or for pictures only. It's possible to set apart any bit of the screen as a 'window' where either will appear and this allows, for instance, the well-known Apple trick of having several lines of text at the bottom of the screen and a picture above, with the text scrolling only in those lines. The difference is, of course, that the BBC Micro can have five lines. Or it can have the whole left side of the screen, or a bit at the top and a bit at the bottom, or anywhere. Full word-wrap scrolling is handled inside each text window. And one can label diagrams with text, too.

Most of these features are fully detailed in the BBC's leaflet on the system and so this is a selection of things that appeal. But possibly the most important thing about the system is its strong encouragement to the owner to write machine code programs. Machine code is difficult, usually, mainly because there are so few really friendly software tools for producing it. On the BBC Micro, the tools are more friendly than most Basic software tools.

For example, the system has that very nice Acorn Atom feature of allowing you to write in assembler mnemonics behind square brackets, and of editing them in exactly the same way you edit Basic. That is, if you leave out a line between lines 50 and 60, you just type in line 55, and the missing instruction is automatically inserted between them.

If you need some arithmetic done, you can load the accumulator with the result of a calculation done with Basic -- that is, LDA # 10* SIN RAD 45 will load the accumulator with the value. No more tedious attempts to write machine code mathematics routines!

There are lots of other things to drool over and in the space available, they will just have to be left out of this list. One which I must find space for, however, is the Tube.

The BBC Micro should never go out of date the way other 6502-based micros will because of its ability to perform as a keyboard unit controlling another computer. By May, Acorn promises, there will be the add-on Z80-based board, as well as an ultra-fast 6502 board with 60k bytes of user RAM. And the Z80 board will run CP/M programs, with the 6502 front bit handling the CP/M operations.

This will be done by trapping all CP/M system calls in the Tube, which watches the CP/M memory location. Whenever it is required to display some text on the screen, or to read or write disk data, or to input something from the keyboard, the Z80 will fill a 32 character buffer with the required information, as fast as it can and the 6502 will read it out from the other box and act on it. When the Z80 starts processing its application again, it will be quite happy that it handled the CP/M system command itself. But it will have been much faster than real CP/M, which is not efficiently coded and which has one or two bugs in it.

It's hard to see anybody being disappointed with this system.

BBC Basic

While we heard reports of a raging controversy around the BBC's choice of Acorn as the manufacturer of its microcomputer. a quieter stir was caused by the decision to make Basic the machine's 'natural' language. For entirely inexplicable reasons, programming languages arouse strong emotions in their devotees' hearts. Each language attracts its band of followers and it sometimes seems that the more obscure or difficult or awkwardly-syntaxed the language, the more fanatical its proponents.

Basic in particular seems to anger more people than just about any other aspect of microcomputing, yet it has helped thousands of newcomers to get to grips with their machines, which would certainly not be the case were Pascal, say or APL the most commonly-implemented languages on micros.

It seems that before the decision on Basic was finalised, some lively debates took place as to the 'best' language to use on the BBC machine, with Pascal and Comal devotees being notably anxious to push their languages on the theory that if the public was to be taught programming, it should be taught tidy, academically-satisfying structured programming from the start. Although other languages are planned for the BBC Micro, it was Basic which won in the end, probably because it is so easy to learn, although the fact that a Basic was under development for the Proton before it became the BBC Micro must have been an important factor. Once the Acorn and Basic decisions had been made, a further *frisson* circulated when

CYBERNETICS RESEARCH

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people remembered what the Basic was like on the Acorn Atom; would the BBC Micro have the same very non-standard Basic, people wondered?

For those of you unfamiliar with Atom Basic, it incorporates a number of very non-standard features. These pose absolutely no problem if you're learning Basic for the first time but can be most inconvenient if you're moving to the Atom from a machine with a more standard Basic, or if you want to move on from the Atom to another machine — in either case you have quite a bit of re-learning to do. On the plus side, though, Atom Basic has some very nice features indeed, such as allowing you incorporate assembler language mnemonics into a Basic program.

For the BBC machine, the same team which developed Atom Basic evolved a far more standard implementation of the language which makes the conversion to or from another machine (both of user and of programs) much easier, while retaining some of Atom Basic's more elegant features.

There is, of course, no such thing as a 'standard' Basic, as each implementation has a number of features designed to fit in with the particular machine's hardware facilities. In the case of BBC Basic, while a large proportion of its facilities are similar to Microsoft Basic (about the nearest thing to a standard Basic you can get), there are extra features to take advantage of the machine's sophisticated hardware, mostly in connection with the graphics and sound capabilities. A full list of the BBC Basic's features is printed here, so we'll just look at some of the more unusual/interesting facilities here.

BBC Basic reserved words

ABS
ACS
ADVAL
AND
ASC
ASN
ATN
AUTO
BGET
BPUT
CALL
CHAIN
CHR$
CLEAR
CLOSE#
CLG
CLS
COLOUR
COS
COUNT
DATA
DEG
DEF
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END
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ENVELOPE
EOF
EOR
ERR
EVAL
EXP
EXT$
FALSE
FN
FOR
GCOL
GET
GOTO
GOSUB
HIMEM
IF
INKEY
INPUT
INPUT LINE
INPUT#
INSTR
INT
LEFT$
LEN
LET
LIST
LN
LOAD
LOCAL
LOG
LOMEM
MID$
MOD
MODE
MOVE
NEW
NEXT
NOT
OLD
ON
OPENIN
OPENOUT
OPT
OR
PAGE
PI
PLOT
POINT
POS
PRINT
PRINT$
PROC
PTR#
RAD
READ
REM
RENUMBER
REPEAT
REPORT
RESTORE
RETURN
RIGHT$
RND
RUN
SAVE
SGN
SIN
SOUND
SPC
SQR
STEP
STOP
STR$
STRING$
TAB
TAN
THEN
TIME
TOP
TO
TRACE
TRUE
UNTIL
USR
VAL
VDU
VPOS
WIDTH

Starting with the graphics, you can select any of the eight modes with the MODE statement, i.e. MODE 3 or MODE A. CLG clears the current graphics area on the VDU; GCOL sets the fore and backward graphics colours and COLOUR allows you to play clever tricks, such as making an object move in front of the background but behind an object in the foreground. POINT returns the colour of a specified point on the screen. DRAW and PLOT appear to be very similar; they give very comprehensive control over graphics displays, including the drawing and in-filling of triangles. There isn't space here to describe all of the very powerful graphics capabilities of the BBC Micro, but it's safe to say that the machine offers about the most sophisticated graphics available at the price.

Similarly, the sound generator is very powerful, having three channels for music and one for 'noise'. It's controlled by a couple of commands which are deceptively complex and will take some real getting to grips with before the machine's full sound potential can be exploited. First, the ENVELOPE statement, which is used to define the shapes of up to 16 envelopes and requires *14* parameters! These sounds are played using the SOUND statement, which defines the channel to be used, the envelope number and the note's frequency and duration. Built in is the ability to 'stretch' all or even parts of each envelope, too!

At a less exotic level, BBC Basic has some other nice features. Yes, you can type in assembler mnemonics and, with many statements requiring parameters, etc, in brackets, the brackets can be omitted, ie, ADVALn (which returns the last known value of analogue-to-digital converter channel n) can be written as ADVAL(3) or ADVAL3 or ADVALN, etc. And in conditional statements, such as IF A=B THEN C=D, the THEN can be left out.

BBC Basic allows multi-line definitions of both functions and procedures. A very useful feature of procedures is that you can define local variables within them, which saves having to keep a careful track of variable names. And those variable names can, incidentally, be of any length with all characters significant; further, upper and lower case characters are recognised separately, so TOTAL is different to 'total'. You'd have to be careful about this, though, for it would eat up RAM space quite extravagantly. You can use reserved words as variables in lower case, so goto=3 would be legal but not GOTO=3.

There are other nice features, too, such as the ability to re-define the character set (although this needs some care as some of the non-printing ASCII characters are recognised as control codes). And it's possible to place text anywhere on the screen, not just in pre-defined lines, which would allow you to do fancy things like displaying superscripts and subscripts or proportionally-spaced text.

Conclusion

As an enthusiastic machine, it allows the attachment of add-on bits and pieces . . . no, that's not true, it positively *insists* that you add on bits and pieces. Things like stepper motor controllers, sensor inputs, and all the other aspects of wiring a computer into an office or a house.

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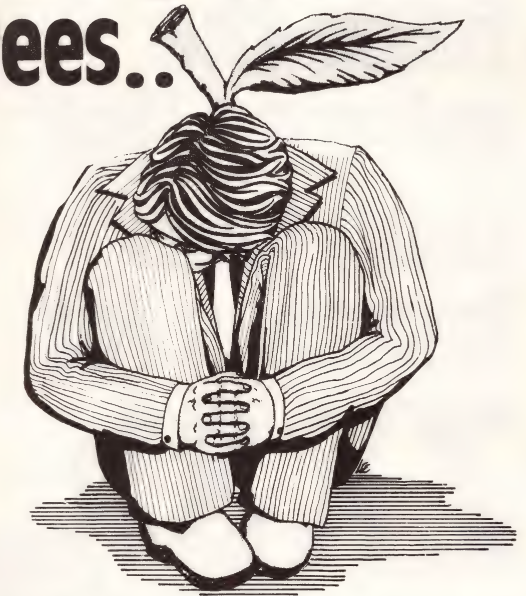

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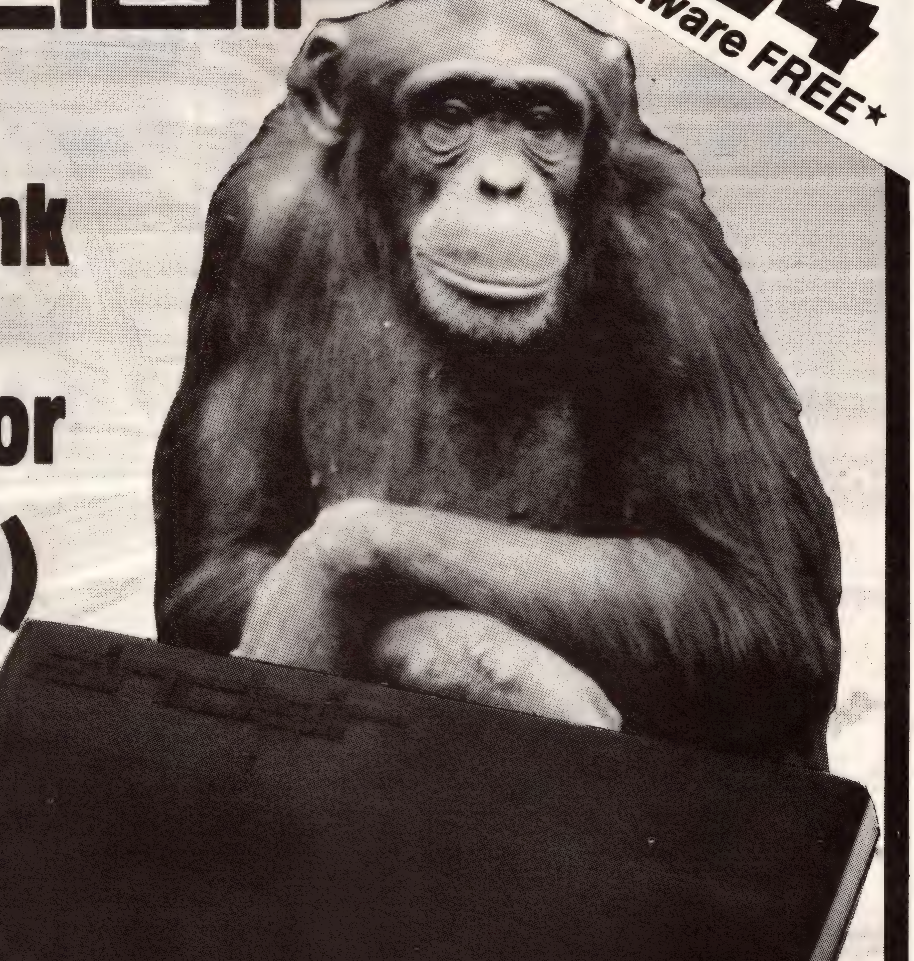

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Disk Sorting Routine

by Jeff Richards

Many different sorts have been published for the home computer user, but most of them have assumed that the data to be sorted can be stored in memory. While this may frequently be true of numerical items, when it comes to sorting alphanumeric codes, inventory part numbers for instance, a disk sort is necessary. The program presented here permits sorting of as many items as can be fitted on the disk.

A disk sort must be constructed slightly differently to a memory sort. In the case of memory any location is as accessible as any other, but this is certainly not so in the case of a disk. If all the data to be sorted cannot be loaded into memory, then a procedure must be developed that does as much sorting as possible in memory, and keeps the number of separate disk accesses to a minimum.

The procedure used here involves merging sorted strings. That is, the data to be sorted is firstly broken up into small chunks. The size of the chunk is set so that it can be loaded into memory and sorted. These sorted chunks, or strings, are then written to a work file. The merge phase involves reading each chunk from the work file and merging it with the output file that is gradually built up.

For example, consider the following sequence to be sorted:

F,R,U,S,D,E,A,T,M,N,I,K,P,W,X,G,J,C,L,H

If we select a size of chunk of 5, then the first sets of ordered strings will be

D,F,R,S,U
A,E,M,N,T
I,K,P,W,X
C,G,H,J,L

and these will be written in sequence to the work file.

In the merge phase these strings will be read and merged with existing items in a sorted work file. Two files are used, alternating between input and output.

#2 WORK1 –
#1 INPUT – D,F,R,S,U
#3 WORK2 – D,F,R,S,U

#2 WORK2 – D,F,R,S,U
#1 INPUT – A,E,M,N.T
#3 WORK1 – A,D,E,F,M,N,R,S,T,U

#2 WORK1 – A,D,E,F,M,N,R,S,T,U
#1 INPUT – I,K,P,W,X
#3 WORK2 – A,D,E,F,I,K,M,N,P,R,S,T,U,W,X

#2 WORK2 – A,D,E,F,I,K,M,N,P,R,S,T,U,W,X
#1 INPUT – C,G,H,J,L
#3 WORK1 – A,C,D,E,F,G,H,I,Q,K,L,M,N,P,R,S,T,U,W,X

The procedure to merge the sorted input string with the sorted string in the work file is quite straightforward. The only complexity is dealing with the situation of having more input to merge when the work file is empty, or having more items in the work file when there is no more input to merge.

The only restriction on the data to be sorted is that the number of passes must be even. By imposing this limitation the calculation of when all the data is sorted, and which work file it is in, is considerably simplified.

The number of passes is half the number of items on file divided by the size of each chunk. The size of the file is probably fixed, though it could be rounded upwards to a suitable figure. The size of each chunk should be as large as possible, remembering that the number of passes must be even, and the larger each chunk is the quicker the sort will be.

The memory sort at 10000 is quite fast, but could easily be replaced by any of the super-sorts that have been published. Its impact on the total sort time is slight – the disk accesses to merge the strings take by far the longest time.

The program assumes that the input data consists of a sequential file with a code (for sorting) and a reference number. This reference number would be the record number of the item in the master file. That is, we are not sorting the masterfile itself, but an index to

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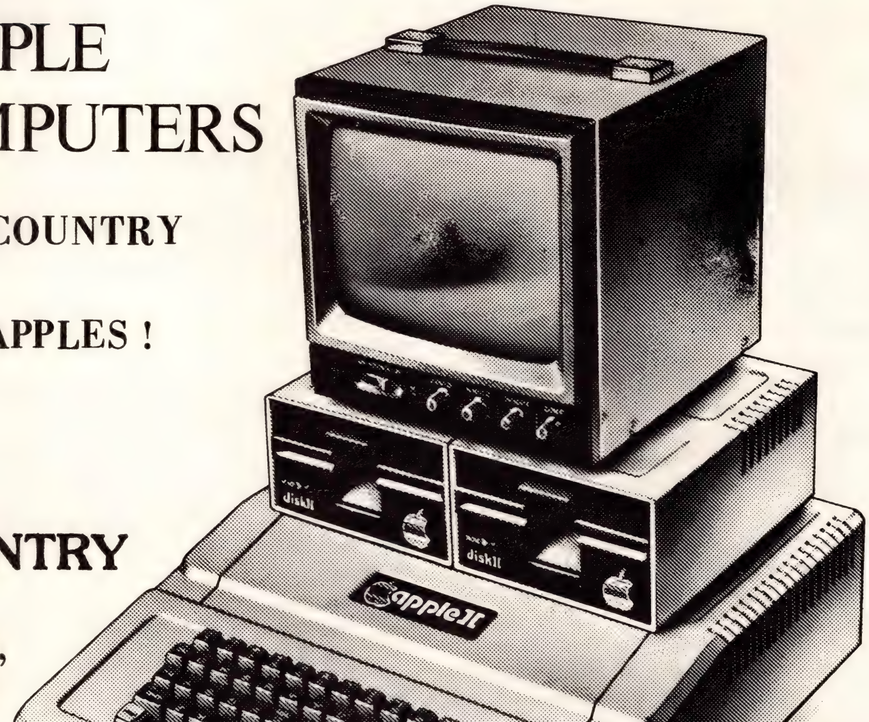

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the masterfile. Sorting an index rather than the master file provides a significant speed advantage.

Also, sorting the index rather than the master file does mean that we can sort, on one disk, a file that is physically almost as large as the disk capacity. A suitable arrangement would be to have the master file on drive B and to create the index and sort it on drive A.

However, this is not possible if we want to physically reshuffle the master file, as this requires that two copies of the file exist at once. But it is often not necessary that the master file be reshuffled. If we maintain the sorted index we can always access the master file in sequence by using the index to find the actual physical location of the master file item. This is particularly true if the master file is only being sorted in order to print a report, and would otherwise have to be sorted back into its original sequence when the report is finished.

This disk sort is not the most efficient that can be devised, but it is reasonably simple, and is suitable for a variety of purposes. And when the data to be sorted will simply not fit in memory, then some sacrifice in sorting speed must be accepted.

```
*** DSKSRT   MICROSOFT BASIC-80 Rev 5.2
*** 400 ITEMS IN 4 PASSES
    EACH OF 2 FILES OF 50 ITEMS
*** NOTE THAT 'PASSES' MUST BE EVEN
  30 DEFINT A-Z
  40 FILLEN=400:CHUNK=50
  50 NOCHKS=FILLEN/CHUNK
  60 PASSES=NOCHKS/2
  70 PRINT "SORTING THE WORK FILE"
 100 DIM A(CHUNK),A$(CHUNK)
 110 OPEN "I",#1,"WORK"
 120 OPEN "O",#2,"WORK1"

*** READ INPUT IN CHUNKS,SORT AND WRITE TO WORK1
 150 FOR I1=1 TO NOCHKS
 160   FOR I=1 TO CHUNK
 170     INPUT #1,A(I),A$(I)
 180   NEXT I
 200   GOSUB 10000
 220   FOR I=1 TO CHUNK
 230     WRITE #2,A(I),A$(I)
 240   NEXT I
 250 NEXT I1
 260 CLOSE
 270 KILL "WORK"

    *** PHASE 2 - MERGE THE CHUNKS
 510 NAME "WORK1" AS "WORK"
 520 OPEN "I",#1,"WORK"
 530 OPEN "O",#2,"WORK1"
 550 FOR I1=1 TO PASSES
 560   PRINT "*** PASS ";I1;CHR$(13);
 570   CLOSE #2:CLOSE #3
 580   OPEN "I",#2,"WORK1"
 590   OPEN "O",#3,"WORK2"
 600   GOSUB 1000
 610   CLOSE #2:CLOSE #3
 620   OPEN "I",#2,"WORK2"
 630   OPEN "O",#3,"WORK1"
 640   GOSUB 1000
 650 NEXT I1

    *** NOW FINISH UP
 670 CLOSE
 680 KILL "WORK"
 690 NAME "WORK1" AS "WORK"
 700 KILL "WORK2"
 710 STOP
```

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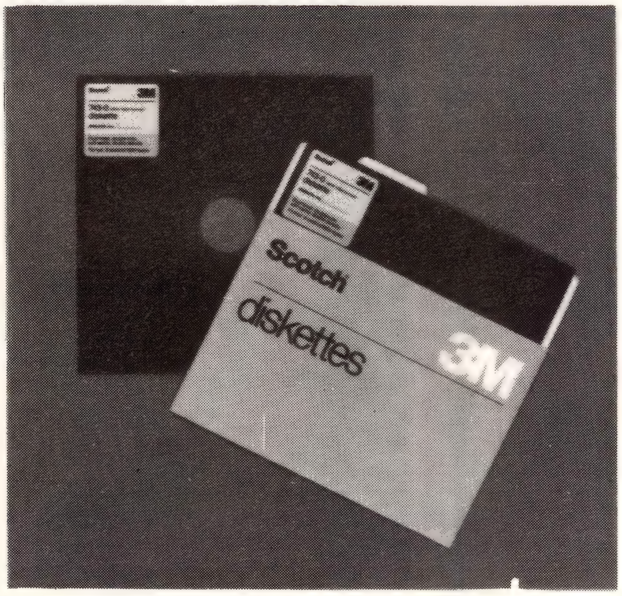

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```
    *** MERGE #1 INTO EITHER #2 OR #3
1000 FOR I=1 TO CHUNK
1010   INPUT #1,A(I),A$(I)
1020 NEXT I
1030 I=1
1040 IF EOF(2) THEN 1100
1050 INPUT #2,B,B$
1060 IF A$(I)<B$ THEN 1140
1070 WRITE #3,B,B$
1080 GOTO 1040

    ***  NO MORE INPUT - WRITE THE ARRAY
1100 WRITE #3,A(I),A$(I)
1110 I=I+1
1120 IF I>CHUNK THEN 1220
1130 GOTO 1100
1140 WRITE #3,A(I),A$(I)
1150 I=I+1
1160 IF I<=CHUNK THEN 1060

    ***  NO MORE ARRAY - WRITE THE INPUT
1180 WRITE #3,B,B$
1190 IF EOF(2) THEN 1220
1200 INPUT #2,B,B$
1210 GOTO 1180
1220 RETURN

    ***  MEMORY SORT A() ON A$()
10000 N=CHUNK
10010 M=N
10020 M=INT(M/2)
10030 IF M=0 THEN RETURN
10040 J=1:K=N-M
10050 I=J
10060 L=I+M
10070 IF A$(I)<=A$(L) THEN 10120
10080 SWAP A$(I),A$(L):SWAP A(I),A(L)
10090 I=I-M
10100 IF I<1 THEN 10120
10110 GOTO 10060
10120 J=J+1
10130 IF J>K THEN 10020
10140 GOTO 10050
```

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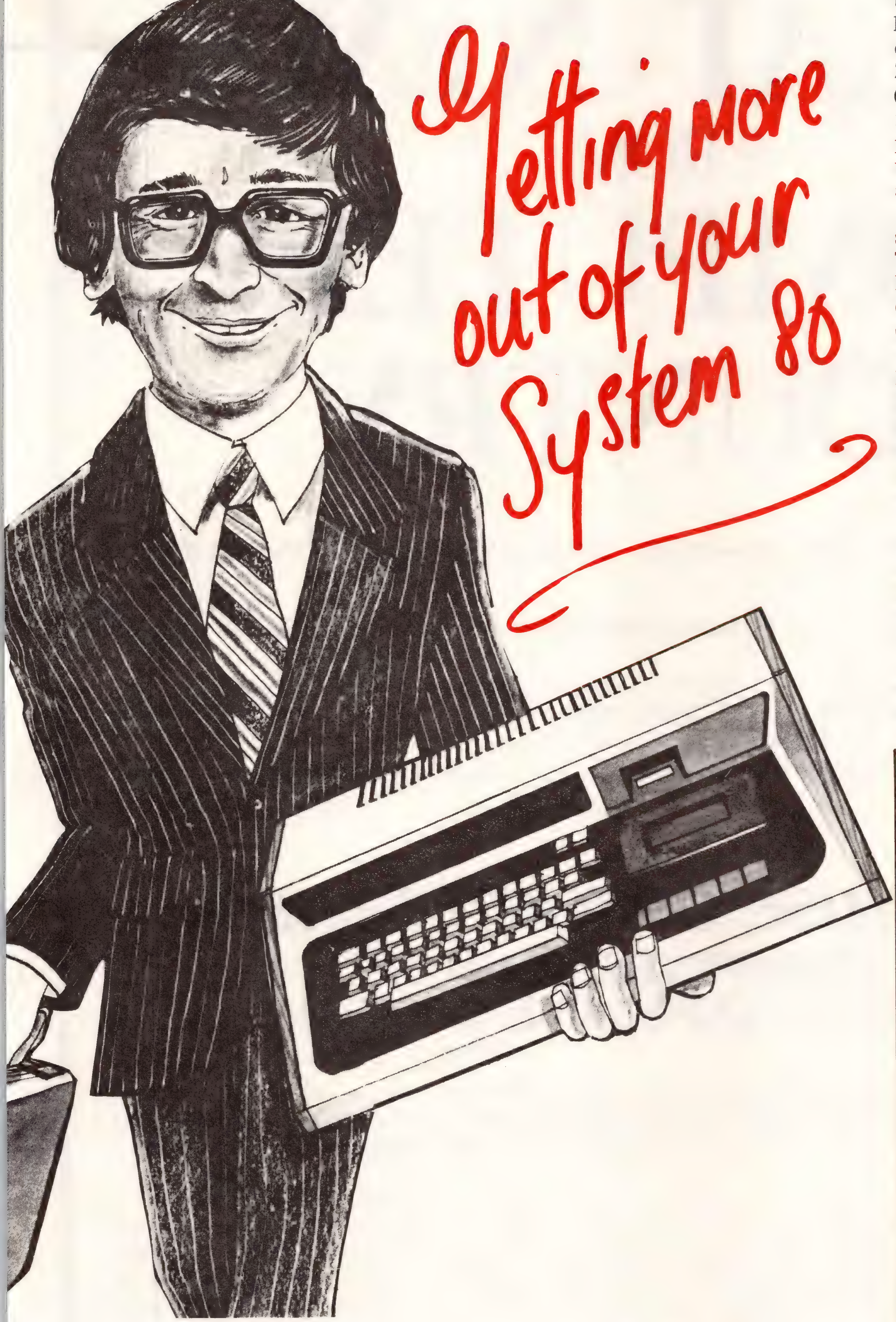

by W. W. Crandall Jr.

The System 80 is a good computer with great potential in the business, home, and educational fields. Unfortunately, the accompanying Basic manual is poorly written and leaves out a significant number of commands and "tricks" for the System 80. This article spells out these commands and how they work, teaches you a few "tricks", and attempts to clear up any confusion you may have about certain aspects of the System 80.

The keyboard of the System 80 differs from that of the TRS-80 in many respects. The (ENTER) key on the TRS-80 has been replaced with a (NEW LINE) key. The TRS-80's (CLEAR) and (–>) (an eight-space tabulator) keys are missing from the older System 80s, yet it is possible to access both keys using the following sequence. To execute a (CLEAR), depress these four keys simultaneously: (SHIFT) (CTRL) (A) (D). (Note: the (SHIFT) (CTRL) (A) is a pseudo-(BREAK) which generates a (BREAK) and a (CHR$(1). To execute a (–>), depress these three keys: (SHIFT) (CTRL) (I). The newer System 80s now have true (CLEAR) AND (–>) keys.

Four characters ([, \, ↑, –) are not represented on the System 80's keyboard but again it is possible to access them. First, depress the (Z) and (2) keys simultaneously. Keeping these keys depressed, backspace twice to erase the Z and the 2. Now, gently press the (3), (4), (5), (6), or (7) key and a [, \,], ↑, or –, respectively, will be printed. Press lightly or the numbers will be printed with the special character.

There are four ways to clear double spacing on the System 80's screen. The double spacing is caused by a PRINT CHR$(23) or a (SHIFT) (CTRL) (Y). It can be cleared with a CLS (which clears the screen and homes the cursor), a PRINT CHR$(28) (which homes the cursor), a POKE 16445,0 (which reestablishes the normal 64 characters per line mode without affecting anything else), or by depressing the (CLEAR) key (which clears the screen).

Several commands require a line number to work. With four of them, AUTO, LIST, EDIT, and DELETE, the line number may be replaced with a period. The period acts as a substitute for the line number of the line most recently listed, entered, executed, or edited. Study the example below to see exactly how this works.

```
READY
>10 PRINT "LINE 10"
>20 PRINT "LINE 20"
>LIST.
20 PRINT "LINE 20"
READY
>DELETE.
READY
>LIST
10 PRINT "LINE 10"
READY
>30 PRINT "LINE 30"
>AUTO.
30*REM
40 PRINT "LINE 40"
50 (BREAK)
READY
>EDIT.
40 _
```

Level II Basic does not permit control characters (ASCII 0–31) to be entered into program lines via the active command level. You may, however, enter some control characters (ASCII 2–26) while in the I(nput mode at the EDIT level. To enter a control character, depress the (SHIFT) and (CTRL) keys together. (This generates a line feed which may be D(eleted once you have left the I(nput mode.) Then press the key of the control letter you desire and the control character will be entered into the program line. Be careful because the System 80 does not like this unorthodox method and errors will occur if you don't watch out. For example, the System 80 accepts a control H (.(BACKSPACE)) in the I(nput

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mode but does not enter it into the program line. Instead, it believes that you have rubbed out the character preceding the control H.

The System 80's Basic manual discusses only three of the five error trapping commands. According to the manual, it is possible to trap an error using an ON ERROR GOTO statement, return from an ON ERROR GOTO subroutine using a RESUME, and generate a simulated error using ERROR. The other commands, ERR and ERL, let you find the error's code number (see the manual's Appendix B) and the line in which the error occurred. To see how these commands may be used, examine this program:

```
10 'SAMPLE ERROR TRAPPING PROGRAM
20 ON ERROR GOTO 100
30 B=5 : C=0
40 'NEXT LINE WILL BE A DIVISION BY0 ERROR
50 PRINT B/C
60 'NEXT LINE WILL BE A SYNTAX ERROR
70 PRUNT "HELLO"
80 END
100 'ON ERROR GOTO SUBROUTINE
110 PRINT "ERROR IN LINE #";ERL
120 PRINT "ERROR CODE #";(ERR/2)+1
130 'RESUME TO NEXT LINE
140 RESUME NEXT
```

As you can see, much more sophisticated error trapping is possible under these extra commands. Note that the error code returned by ERR is not the true error code and to find the true code, you must divide the ERR by two and add 1. Also, the command REM (for REMark) can be replaced by a '((SHIFT) (7)) just as PRINT can be replaced by a ? ((SHIFT) (/)).

The command FRE is also not mentioned in the manual. FRE has two uses. Used with a numerical value (ie: FRE(0), FRE(AX), FRE(R%)), it returns the number of free bytes remaining in the computer's memory, just as the command MEM does. If it is used with a literal string (ie: FRE(C$), FRE("ABC"), FRE("Q")), it will return the number of free bytes remaining in the variable table. The size of the variable table is set using the CLEAR command; its default size is 50 bytes.

Memory, an integral part of any computer, is barely mentioned in the Basic manual. When memory is mentioned, the manual is often not entirely correct. Consider the memory map in the user's manual. It fails to show the 745 bytes of "reserved RAM" on top of the video display memory. In this area, the vectors for command words and other vital data are held. If a user unknowingly pokes a value into memory between 16383 and 17128, chances are that the machine will fly off into outer space, leaving behind a puzzled programmer, wondering what the problem is.

The SYSTEM command, which is again skimmed over in the manual, places you into the monitor level of the System 80 (* ? prompt). Here, you are able to load machine language tapes and you are able to execute machine language routines. Z-80 machine language, the machine language that the System 80 uses, is a series of instructions, like Basic, that may be put together to form a program. Machine language is faster than a high level language, such as Basic or Cobol, because it can be interpreted directly by the computer's microprocessor – but machine language is harder to program. (Anyone interested in learning about Z-80 machine language is advised to read "TRS-80 Assembly Language Programming" by W. Barden. It is a good introduction and costs $3.95 from Radio Shack).

To load a machine language program from the monitor, enter the file name of the program (up to six letters), ready the cassette, and then press (NEW LINE). Once loaded, the program can be executed by entering a / followed by (NEW LINE). To execute a routine starting at a certain location in memory, you may enter a / plus the starting address of the routine which must be a decimal number less than 65536, followed by (NEW LINE). If you ever wish to go to the power-up READY ? message, get into the monitor by using SYSTEM and enter a /O (NEW LINE). This command "duplicates" turning on the power and also permits you to avoid the fifteen second delay between turning on and turning off the power.

Writing machine language programs is unbrearable without an assembler. An assembler permits you to write assembly language programs which are then compiled into machine language. The following assembly language program changes the text screen to white. The far left column contains the memory locations of machine language values, the second column contains the machine language values, the next column contains line numbers of the assembly language program, the fourth column contains labels, the second to last contains the assembly language program, and the last holds comments. When the program is compiled into machine language, it is possible to save it on tape so that it can be loaded and executed later using the SYSTEM command. A good comparison between Basic and machine language execution speeds can be found by comparing the machine language program shown below and a Basic program doing the same thing. The machine language program takes 25150 usecs while a Basic program using POKE takes seven seconds; a Basic program using SET takes forty-eight seconds . . EJECT. Sample Z-80 machine/assembly language program:

```
7000: F5        00100 START PUSH AF      ;***FILLER ML ROUTINE***
7001: C5        00120       PUSH BC
7002: D5        00130       PUSH DE
7003: E5        00140       PUSH HL
7004: 21003C    00150 LD  HL,15360  ;STARTING  ADDRESS  OF  TEXT
PAGE
7007: 010004    00160       LD BC,1024   ;NUMBER OF BYTES IN PAGE
700A: 16BF      00170       LD D,191     ;WHITE GRAPHICS CODE
700C: 72        00180 DOIT  LD (HL),D    ;CHANGE SCRN CHAR TO WHITE
700D: 23        00190       INC HL
700E: 0B        00190       DEC BC
700F: 78        00200       LD A,B       ;CHECK IF IT
7010: B1        00210       OR C         ;IS DONE
7011: 20F9      00220       JR NZ,DOIT   ;IF NOT FILLED, GOTO DOIT
7013: E1        00230 DONE  POP HL
7014: D1        00240       POP DE
```

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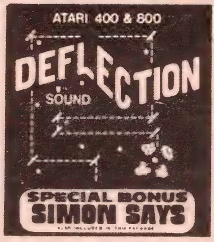

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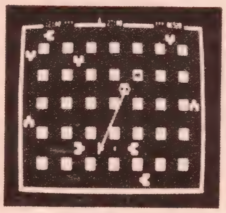

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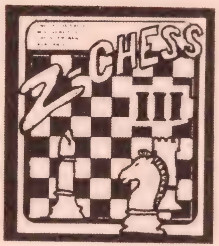

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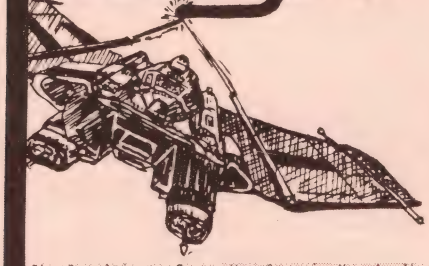

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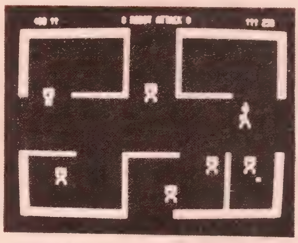

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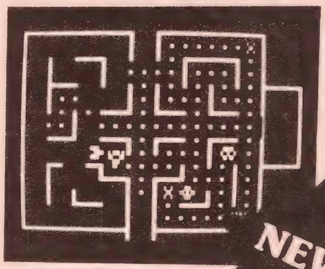

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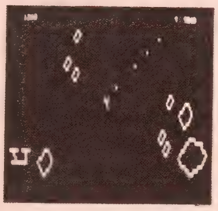

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```
7015: C1       00250       POP BC
7016: F1       00260       POP AF
7017: C9       00270       RET          ;RETURN FROM SUBROUTINE
```

The READY ? power-up prompt is confusing and is better explained by the TRS-80's MEM SIZE ? . The purpose of the prompt is to permit you to reserve part of high memory for machine language subroutines and programs. For example, to reserve 150 bytes of high memory on a 16k machine, you would enter 32617 in response to the READY ? prompt. (32617 = 32767 (top of memory on a 16k machine) – 150 (number of bytes to reserve)). This leaves all the memory between 32617 and 32767 reserved. If part of memory is reserved, then no variables or any part of a program will be put into this area, so protecting the machine language data. If you respond to the prompt with just a (NEW LINE), no part of memory will be reserved.

In Basic, machine language subroutines can be executed in two ways. The USR command, which is detailed in the Basic manual, lets you pass values between the machine language routine and the Basic program. It is also possible to change vectors in reserved RAM so that a vector is pointing to the machine language routines, so the routine can execute without a USR command. APC-80 does this by changing the error and ON ERROR vectors to point to its interpreter. "Microsoft Basic Decoded & Other Mysteries" by Farvour ($29.95 at most computer shops) is lacking in many areas but does cover extensively the vectors in reserved RAM. This book is a must if you intend to alter these vectors.

Although it is possible to store machine language programs in the reserved part of high memory, there is a far more convenient way to store them. You can store a machine language program in a variable and then, by determining the starting address of the variable by using the VARPTR command, execute it using the USR command. (VARPTR and USR are described in the Basic manual's addendum). A string variable (ie: A$ or RN$(1)) is easiest to use for storing the program; the program below shows uses of the VARPTR and USR commands:

```
100 'WE WILL USE THE ASSEMBLY LANGUAGE
110 'PROGRAM THAT WAS DESCRIBED ABOVE
120 '
130 'STRING SECTION:
140 'SET UP ROUTINE BY MAKING A STRING WITH
150 'APPROPRIATE ASCII -- NB:  THIS METHOD
160 'LIMITS YOU TO MACHINE LANGUAGE ROUTINES
170 'OF 255 BYTES (MAXIMUM STRING LENGTH)
180 RESTORE
190 FOR X=0 TO 23
200 READ Y
210 A$=A$+CHR$( Y )
220 NEXT
230 '
240 'VARPTR SECTION:
250 'DETERMINE STARTING LOCATION IN MEMORY
260 'OF VARIABLE
270 'MSB= MOST SIGNIFICANT BYTE OF STARTING ADDRESS
280 'LSB=LEAST SIGNIFICANT BYTE OF STARTING ADDRESS
290 K=VARPTR( A$ )
300 MSB=PEEK( K+2 )
310 LSB=PEEK( K+1 )
320 '
330 'USR SECTION:
340 'SET UP USR VECTORS BY POKING MSB AND LSB
350 'INTO USR VECTOR LOCATION
360 POKE 16527,MSB
370 POKE 16526,LSB
380 '
390 'EXECUTION SECTION:
400 Z=USR( 0 )
410 END
420 '**********************************************
430 'HIGH-MEMORY SECTION:
440 'PUT ROUTINE INTO RESERVED HIGH MEMORY
450 'ASSUMING A RESPONSE OF 30000 TO THE POWER-UP READY ? PROMPT
460 '( IE:  READY ? 30000 (NEW LINE)  )
470 'CLEAR SCREEN AND RESTORE DATA POINTER
480 CLS
490 RESTORE
500 FOR X=30000 TO 30023
510 READ Y
```

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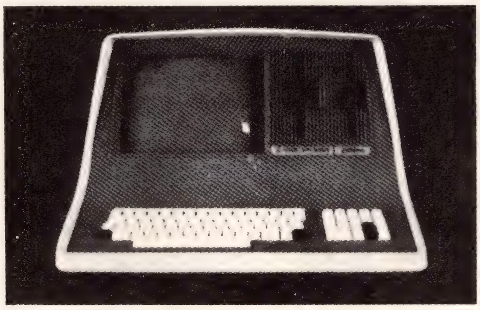

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```
520 POKE X,Y
530 NEXT
540 'DETERMINE MOST AND LEAST SIGNIFICANT BYTES OF 30000
550 MSB=(30000/256)
560 LSB=30000-(INT(MSB)*256)
570 '
580 'USR SECTION:
590 'SET UP USR VECTORS
600 POKE 16526,MSB
610 POKE 16527,LSB
620 '
630 'EXECUTION SECTION:
640 Z=USR(0)
650 END
660 'HERE ARE DATA FOR MACHINE LANGUAGE ROUTINE
670 DATA 245,197,213,229,33,0,60,1,0,4,22,191,114,35,11,120,
        177,32,249,225,209,193,241,201
```

It is hoped that your computing horizons have widened. The System 80 is dynamic and powerful and provides many significant advantages over the TRS-80. It is cheaper, has an S-100 bus compatibility, a slightly enhanced Level II Basic, more characters available from the keyboard, an inbuilt cassette with provision for a second, and does not smell of second hand leather.

[redacted]

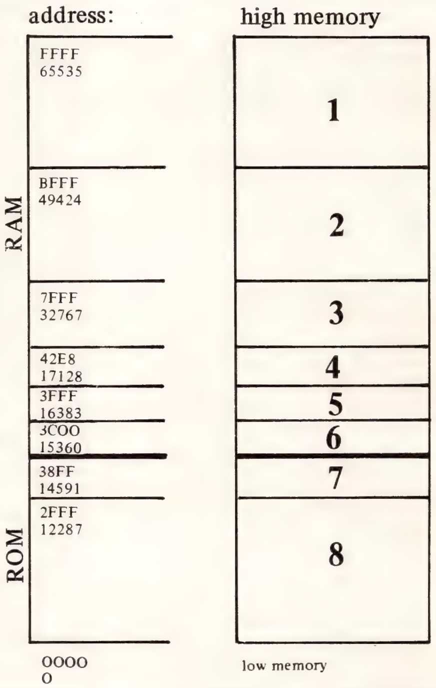
SYSTEM 80 MEMORY MAP

1. 48k RAM
2. 32k RAM
3. 16k RAM
4. vectors and data
5. video display
6. keyboard input
7. unused ROM – for Level III expansion
8. Basic interpreter in ROM

RAM= read and write memory (random access memory)
ROM= read only memory

I/O Port Assignment

internal cassette	: port 255 (FF)
external cassette	: port 254 (FE)
printer	: port 253 (FD)



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NEWCOMERS-START HERE

What follows is a brief guide for the microcomputing novice. It has been designed for quick reference — with all the key words in bold type; of course if you're feeling adventurous, you're welcome to read it right through. Whichever way, we trust you will find it helpful. Happy Microcomputing!

Welcome to the confusing world of the microcomputer. First of all, don't be fooled; there's nothing complicated about this business, it's just that we're surrounded by an immense amount of necessary jargon. Imagine if we had to continually say "numbering system with a radix of sixteen in which the letters A to F represent the values 10 to 15", when instead we can simply say "hex". No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, APC will be publishing this guide – every month.

We'll start by considering a microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, processing it, storing the results or sending them somewhere else. All this information is called **data** and it comprises numbers, letters and special symbols which can be read by humans. Although the data are (yes, it's plural) accepted and output by the computer in 'human' form, inside it's a different story – they must be held in the form of an electronic code. This code is called **binary** – a system of numbering which uses only Os and 1s. Thus in most micros each character, number or symbol is represented by eight binary digits or **bits** as they are called, ranging from 00000000 to 11111111.

To simplify communication between computers, several standard coding systems exist, the most common being **ASCII** (American Standard Code for Information Interchange). As an example of this standard, the number five is represented as 00110101 – complicated for humans, but easy for the computer! This collection of eight bits is called a byte and computer freaks who spend a lot of time messing around with bits and bytes use a half way human representation called **hex.** The hex equivalent of a byte is obtained by giving each half a single character code (0–9, A–F):

0=0000, 1=0001, 2=0010, 3=0011, 4=0100, 5=0101 ...... E=1110 and F=1111.

Our example of 5 is therefore 35 in hex. This makes it easier for humans to handle complicated collections of Os and 1s. The machine detects these Os and 1s by recognising different voltage levels.

The computer processes data by reshuffling, performing arithmetic on, or by comparing them with other data. It's the latter function that gives a computer its apparent 'intelligence' – the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in memory as bytes. The rules are called **programs** and while they can be input in binary or hex **(machine code** programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the nearer the **programming language** is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is **BASIC.** Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To run such a program the computer uses an **interpreter** which picks up each English-type **instruction,** translates it into machine code and then feeds it into the **processor** for execution. It has to do this each time the same instruction has to be executed.

Two strange words you will hear in connection with BASIC are **PEEK** and **POKE.** They give the programmer access to the memory of the machine. It is possible to read (PEEK) the contents of a byte in the computer and to modify a byte (POKE).

Moving on to hardware, this means the physical components of a computer system as opposed to software – the programs needed to make the system work.

At the heart of the microcomputer system is the central processing unit **(CPU)**, a single microprocessor chip with supporting devices such as **buffers**, which 'amplify' they CPU's signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board **(PCB)** or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large, PCB; in others a bus system is used, comprising a long PCB holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function – for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the **S100.**

The CPU needs **memory** in which to keep the programs and data. Microcomputers generally two types of memory, **RAM** (Random Access Memory) and **ROM** (Read Only Memory). The CPU can read information stored in RAM – and also put information into RAM. Two types of RAM exist – **static** and **dynamic**; all you really need to know is that dynamic RAM uses less power and is less expensive than static, but it requires, additional, complex, circuitry to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Not surprisingly, manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM's contents and cannot alter them in any way. You can buy special ROMs called **PROMs** (Programmable ROMs) and **EPROMs** (Erasable PROMs) which can programmed using a special device; EPROMs can be erased using ultra-violet light.

Because RAM loses its contents when power is switched off, **cassettes** and **floppy discs** are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and playback information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, floppy discs are used on more sophisticated systems.

A floppy disc is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disc, in its protective envelope is placed in a disc drive which rotates it and moves a **read/write head** across the disc's surface. The disc is divided into concentric rings called **tracks**, each of which is in turn subdivided into sectors. Using a program called a **disc operating system,** the computer keeps track of exactly where information is on the disc and it can get to any item of data by moving the head to the appropriate track and them waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts; **soft sectoring** where special signals are recorded on the surface and **hard sectoring** where holes are punched through the disc and around the central hole, one per sector.

Half-way between cassettes and discs is the **stringy floppy** – a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disc system. Hard disc systems are also available for microcomputers; they store more information than floppy discs, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit **(VDU)**, which looks like a TV screen with a typewriter-style keyboard; sometimes these are built into the system, sometimes they're separate. If you want a written record **(hard copy)** of the computers output, you'll need a **printer.**

The computer can send out and receive information in two forms – **parallel** and **serial.** Parallel input/output (I/O) requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, a separate wire carrying each bit. Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to tell the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as **baud rate** and, very roughly, the baud rate divided by 10 equals the number of bytes being sent per second.

To ensure that both receiver and transmitter link up without any electrical horrors, standards exist for serial interfaces the most common is **RS232** (or **V24**) while, for parallel interfaces to printers, the **Centronics** standard is popular.

Finally, a **modem** connects a computer, via a serial interface to the telephone system allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need Telecom's permission; instead you could use an **acoustic coupler,** which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system – Telecom isn't so uppity about the use of these.

COMPUTER GAMES

GO-MOKU

David Levy continues his series with an old Japanese game.

This month we shall look at a game with an enormous number of possible moves at every juncture. The game is known as Go-Moku in most Western countries, though in Japan it is called Jenju. Go-Moku is a two-person game played on a Go board using Go stones; it is the size of the Go board (19 x 19) that gives rise to the enormous branching factor of the game tree.

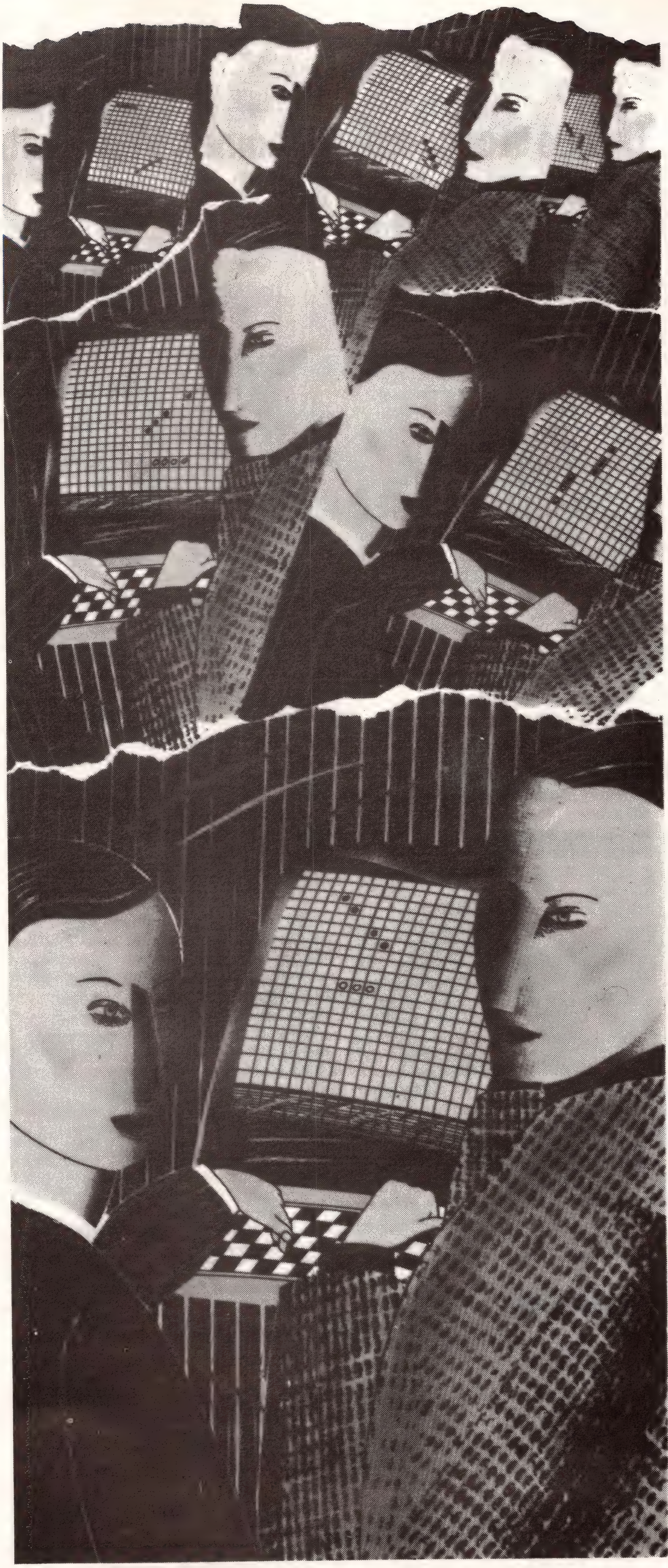
Black always starts and makes a move by placing a black stone on any of the intersections. Thereafter, the players move alternately and the player who first completes a horizontal, vertical or diagonal line of five of his own stones is the winner.

Since five men in a row is enough to win, if you get four men in a row with the two adjacent intersections (at each end of this row) vacant, then on the next move you can complete a row of five (unless your opponent can do so immediately). So an unblocked row of four men is a winning formation. It is now easy to understand that if you have a completely open row of three you are threatening to force a win by making it into an open row of four on the next move and then a row of five on the following turn. The threat to convert a completely open row of three into an open row of four can normally be blocked, simply by closing the row of three at one end and then, when the opponent places a stone at the other end of the row to make a row of four, it is possible to block the only open end of the row of four to prevent it becoming a row of five.

Although it *is* possible to counter the threat of making one completely open row of three into an open row of four, it is obviously not possible to counter two such threats if they exist simultaneously. Thus, the most fundamental winning tactic in Go-Moku is to try to force a position in which you have, simultaneously, two completely open rows of three stones. The simple examples of Figure 1 will help to illustrate these principles.

The following rather obvious statements should be sufficient to teach the absolute beginner enough so that he can understand the principles of the game:

a. The four black stones at N7, O7, P7 and Q7 in Figure 1 form an open row of four. Unless, on his next move, White can complete a row of five stones elsewhere on the board and thereby win the game, White has no way to avoid defeat. If he plays on M7 then Black will play on R7 and win,



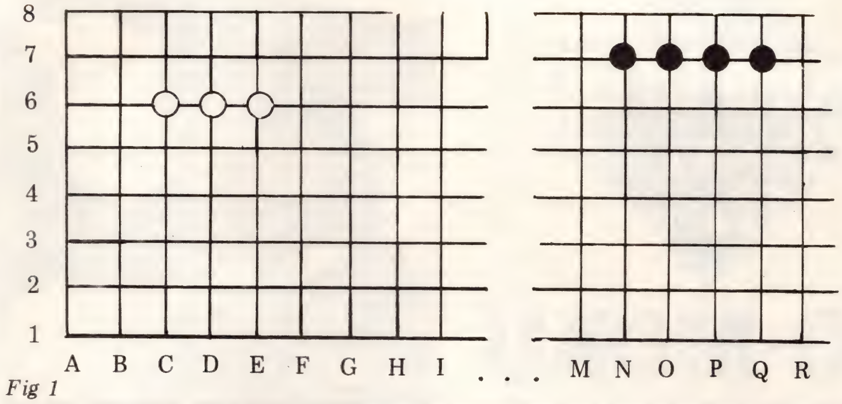


Fig 1

and vice versa.

b. The white stones at C6, D6 and E6 form a completely open row of three. Unless Black takes remedial action against this row, or unless Black can himself force a win on some other part of the board, this row of three threatens to win by becoming an open row of four. For example, if it is now Black's turn and he plays a stone on some useless point, White may place a stone at B6 or F6, in either case creating an open row of four which next move will become a winning row of five.

c. If we now add to the board two more white stones, on F5 and G4, we can see that unless Black has a win on some other part of the board, White will win by making one or other of these rows of three into an open row of four on his next move. Black may stop the horizontal row by placing a stone at B6 or F6, or he may stop the diagonal row by placing a stone at H3 or D7, but he cannot do both simultaneously; and whichever row he does not stop immediately will grow on the next move into an open row of four and then into a winning row of five.

Because this double threat, created by simultaneous rows of three, is absolutely decisive, the game loses much of its interest if no restriction is placed on the players. Try for yourself, playing Go-Moku against a friend and you will both soon discover that it is not terribly difficult to force a double threat situation early in the game. For this reason it is often the rule that a double threat may not be created if both rows of three are capable of being extended into open rows of four. In some cases this restriction is only applied to Black, in order to offset the advantage of the first move.

Program design

Since Go-Moku is a zero sum, two-person game, we can employ most of the tricks of the trade that have been discussed in earlier articles in this series. The program will grow and search a game tree, using some sort of evaluation function to evaluate terminal nodes on the tree. The obvious problem is the size of the tree itself — with 361 intersections on the board, even the alpha-beta algorithm will need to evaluate at least a quarter of a million terminal nodes when performing only a 4-ply search, and that assumes almost perfect ordering. The true number is likely to exceed five million terminal nodes in a 4-ply search, which puts the whole concept of full width search under a big cloud where Go-Moku is concerned. We will therefore need to find some way to prune the game tree, but more about that later.

Evaluation

As I mentioned in an earlier article, there is always a trade-off between selecting a sophisticated but slow evaluation function, which provides a relatively accurate score for a game position, and the other extreme which is a fast but simple evaluation function which permits the search of a larger tree but which does not 'understand' so much when it is looking at a terminal node. William Blake once wrote: 'A fool sees not the same tree that a wise man sees' and his words of wisdom were clearly intended for programmers working on computer games.

In the case of Go-Moku, since the size of the game tree is so enormous, the use of a simple evaluation function with a deep tree search is clearly out of the question. In this sense, an important decision has been made for us by the very structure of the game itself. We must look at a relatively shallow tree, so we ought to ensure that our evaluation mechanism is wise rather than foolish.

Let's start by considering what features might usefully be incorporated in our evaluation function — we shall expand their scope a little further on in this article.

The key to a successful strategy is obtaining some of your own stones, in an unbroken row, in such a way that they could *conceivably* be extended into a row of five. Let us first define some variables.

W1 = the number of single white stones which are in a row, column or diagonal in such a way as to allow the stone to be extended into a row, column or diagonal of five stones.

Using the notation of Figure 1, imagine a white stone on D1 and black stones on A1, F1 and D5. There is no way that the stone on D1 can ever form part of a row or column of five stones, because the horizontal and vertical directions are sufficiently well blocked off by Black, but it *is* conceivable that the stone on D1 could form part of a diagonal of five stones, if White were to be able to place stones on E2, F3, G4 and H5. So in this case W1 would be 1, because this is the number of possible 5-rows that can be made using D1. If there were no black stone on A1 then the value of W1 would be 2 because D1 could be part of a horizontal or diagonal 5-row, and if there were no stone on D5 either the value of W1 would be 3, since 5-rows could be constructed horizontally, vertically and in one diagonal direction.

Similarly, B1 = the number of single black stones which are in a row, column or diagonal in such a way as to allow the stone to be extended into a row, column or diagonal of five stones (which we call a 5-row).

And W2, B2, W3, B3, W4, B4, W5 and B5 are the corresponding variables for situations in which White or Black has a row, column or diagonal with 2, 3, 4 or 5 of his own stones in an unbroken row.

Let us assume for the sake of simplicity that all terminal nodes are at even depth, that is to say we only evaluate a position in which it is the program's turn to move. We shall further assume that the program is White. It is now necessary to assign weights to the features of the evaluation function in such a way as to reflect the worth of a 1-row, a 2-row, a 3-row, a 4-row and a 5-row. Of course a 5-row has infinite value, in the sense that if you make a 5-row you have won the game, so the weighting assigned to W5 and B5 should reflect this fact, in the same way that a chess-playing program would have an infinite value assigned to the kings.

Let the weightings which we assign to these variables be as follows:

AW1 is the weighting assigned to W1;
AB1 is the weighting assigned to B1.

Then the whole of the evaluation function takes the form:

$$(AW1 \times W1) + (AW2 \times W2) + (AW3 \times W3) + (AW4 \times W4) + (AW5 \times W5) - (AB1 \times B1) - (AB2 \times B2) - (AB3 \times B3) - (AB4 \times B4) - (AB5 \times B5)$$

By ensuring that the weightings increase as the indices increase (ie $AW5>AW4>AW3$, etc) we are using our evaluation function to represent the statement: 5-rows are more valuable than 4-rows which are more valuable than 3-rows which are more valuable than 2-rows which are more valuable than 1-rows. And if we ensure that AB5 lies between AW4 and AW5, and that AW4 lies between AB4 and AB5, and that AB4 lies between AW3 and AW4 . . . etc, we are using the function to represent the statement: Make a 5-row if you can, otherwise prevent your opponent from making a 5-row of his own if you can, otherwise make a 4-row of your own if you can, otherwise prevent your opponent from making a 4-row of his own if you can, otherwise. . . etc. The actual values of the AWi and the ABi should be chosen by intelligent guesswork to begin with, and then modified in the light of experience. I have discussed how this might be done, manually and automatically, in earlier articles in this series.

Refinements to the evaluation function

The function described above is simple to understand and to program, yet it encompasses the most important aspects of the game of Go-Moku. Nevertheless, it is rather unsophisticated and I should like to point out ways in which it might be improved.

Consider an empty board on which we place one solitary White stone on the intersection E1. This stone can conceivably form part of four different future 5-rows, or to be more accurate it can form part of 5-rows in four different directions: horizontal, vertical, diagonal towards J5 and diagonal towards A5. So the value of W1 produced by that stone is 4, one for each direction. Now let us remove this stone from E1 and place it on J1. Is the stone of the same value on J1 as it was on E1? Since the value of W1 for the stone on J1 is also 4, just as it was for the stone on E1, it might seem at first as though the two stones *are* of equal value but they are not. Until the game nears its conclusion, much of the value of a particular 1-row, 2-row or 3-row lies in its potential as a threat — the opponent must react in some way to counter the threat. Therefore, part of the strategy of the game lies in placing a stone in such a way as to compel the opponent to reply to one threat and then taking advantage of a different threat which the opponent was unable to meet because he had to attend to something more immediate.

Let us consider the situation of two white stones on E1 and D1, with the rest of the board being irrelevant. If we add a third white stone to C1, a serious threat since a white stone on B1 or F1 would now force a win, the opponent would have to react to this threat by placing a black stone on B1 or F1. White has then not accomplished anything in the horizontal direction because his play has now been blocked and if he puts a stone on F1 Black can counter on G1, and if he plays on B1 Black can counter on A1. But the placing of the third white stone on C1 might well have much deeper implications — it might be part of a plan to create a strong formation over on the left hand side of the board, with a view to extending this formation into a winning threat later in the game.

Now we come to the important difference between having a single stone on E1 and having it on J1. If the planned future activity is in the area of the A-column, B-column and C-column, it is less likely to be successful than if it is in the E-column, F-column and G-column, simply because in the former case this activity is bounded by the left hand edge of the board. If your area of activity is bounded in some way, either by an edge of the board or by a strong (or even impregnable) formation of your opponent's stones, you will be less likely to win than if your area of activity is not bounded. In the latter case you have more opportunity to use the area of activity to create further threats.

What does all this mean in relation to our evaluation function? The obvious implication is that the weighting should vary in some way that reflects the number of vacant intersections to each side of a 1-row, 2-row or 3-row. (The number of vacant intersections to each side of a 4-row is not important, since the 4-row itself will determine the outcome of the game at once.) In the above example it might appear as though the small number of intersections to the left of E1 might be compensated for by the larger number of vacant intersections to the right of E1, and that therefore, E1 and J1 *are* of equal value. But if we think about the nature of the game it is clear that having a formation near the centre of a row, column or diagonal, gives greater flexibility than having that same formation near one or more edges of the board. We should therefore adjust our weightings in some suitable manner, to reflect the desire to have useful formations nearer the centre than the edges. One possible way of doing this is to subtract from a weighting AWi (or BWi), an amount Ci, where Ci is inversely proportional to (1+ number of vacant intersections between the end of a formation and its nearest edge of the board (or enemy stone) in the same direction). Thus, for a single black stone on the D1 intersection of an otherwise empty board, the weighting AB1 would actually be AB1 — (1/3), for the component of the score that is related to the horizontal 1-row. This is because in a horizontal direction the nearest edge intersection to the 1-row on D1 is the intersection on A1, which is two vacant intersections away from D1. The weighting AB1 in the diagonal direction towards the left hand edge would be AB1 — 1/1; the weighting in the diagonal direction towards the right hand edge would be AB1 — 1/1; and finally the weighting towards the top edge would be AB1 — 1/1 (these last three values are due to D1 being on the edge of the board).

The suggestion to subtract a value that is inversely proportional to the 'freedom of movement' of a formation is given here as an indication of the shape that this part of the evaluation function should take. You might find it more satisfactory to subtract the square of that number, or some other function.

Another important refinement of the evaluation function is needed to take care of those situations in which a stone of one colour may have a nearby neighbour of its own colour. For example, white stones on E1 and G1 with no other stones on the first horizontal row. The value of these two stones is clearly more than the value of two individual 1-rows, because the two stones can easily combine into a 3-row if White is permitted to play on F1. On the other hand, two white stones with one vacant intersection between them are worth slightly less than a 2-row because with a 2-row there are four distinct ways of creating a 5-row, whereas with two separated 1-rows there are only three distinct ways (since the vacant intersection between them *must* be occupied). This leads me to suggest that in a situation of this type we employ a weighting mid-way between that of a 2-row and the sum of two 1-rows. If there are two vacant intersections between the two 1-rows, use a weighting one quarter of the way between that of two 1-rows and that of one 2-row, and if there are three vacant intersections take a weighting one eighth of the way between them. Similar logic can be used to suggest weightings for (say) a 1-row separated from a 2-row (in the same horizontal, vertical or diagonal) by one or two vacant intersections, though here as usual, your first guesstimate as to the size of the weighting will almost certainly need to be changed in the light of experience.

The two refinements discussed here are probably necessary for a very strong program, but those of you who wish to keep things simple will, I'm sure, get an entertaining game from a program which employs only the most primitive form of the evaluation function.

Combatting enormous tree growth

The potential size of the Go-Moku tree forces us to introduce some sort of forward pruning from the very first ply of search. The simplest way to do this is to employ the evaluation function also as a plausibility indicator. First your program generates a list of all the legal moves in the root position. (In fact it has this list readily available and updates it whenever a move is made in the tree — the updating consists simply of removing a now occupied intersection from the list of legal moves.) The program then evaluates all the resulting positions at ply-1, using the evaluation function and sorts the moves into descending order of merit based upon these evaluations. The worst n percent of the moves on the list may then be discarded (n can be chosen to suit the execution speed of your program — I would suggest that you start with n = 90). You will now have a list of some 36 moves (at the start of the game) and from each of the 36 positions you again generate and evaluate, discarding the worst (say) 92 percent of the moves at the next ply. The percentage of moves discarded goes up as the tree gets deeper and deeper, and this parameter can be adjusted, dynamically if necessary, so that the program is made to respond in any desired time frame.

Your tree will now be no larger than the tree for a chess program, and move generation will be faster than for chess, so provided you code the evaluation routine in an efficient manner, you ought to be able to perform a search of 4—6 ply within a minute or two, if your program is written in assembler.

Those of you who have been following my earlier articles will already have encountered the concept of the alpha-beta window and the killer heuristic, both of which should be employed in your Go-Moku program. In a large tree the killer heuristic is particularly useful and the fact that you have sorted the moves prior to generation of the replies at each level will help considerably in the optimisation of the alpha-beta routine itself. One other method of speeding the search is to avoid the need to re-evaluate those parts of the board that are not affected by a move in the game tree. You might, for example, keep several different components of the evaluation, and update only those affected by a move. For example, let us assume that the evaluation function has separate components for each horizontal, each vertical and each diagonal. If the program considers a move on the intersection A1, this move will in no way affect the evaluation of a formation in the J column, so part of the evaluation process need not be repeated — it is known to be unchanged. The more you speed up the evaluation process, the deeper the tree can grow, so any technique which updates the evaluation function in an incremental way is certain to be useful.

Tactical search

In most board games it is possibly to

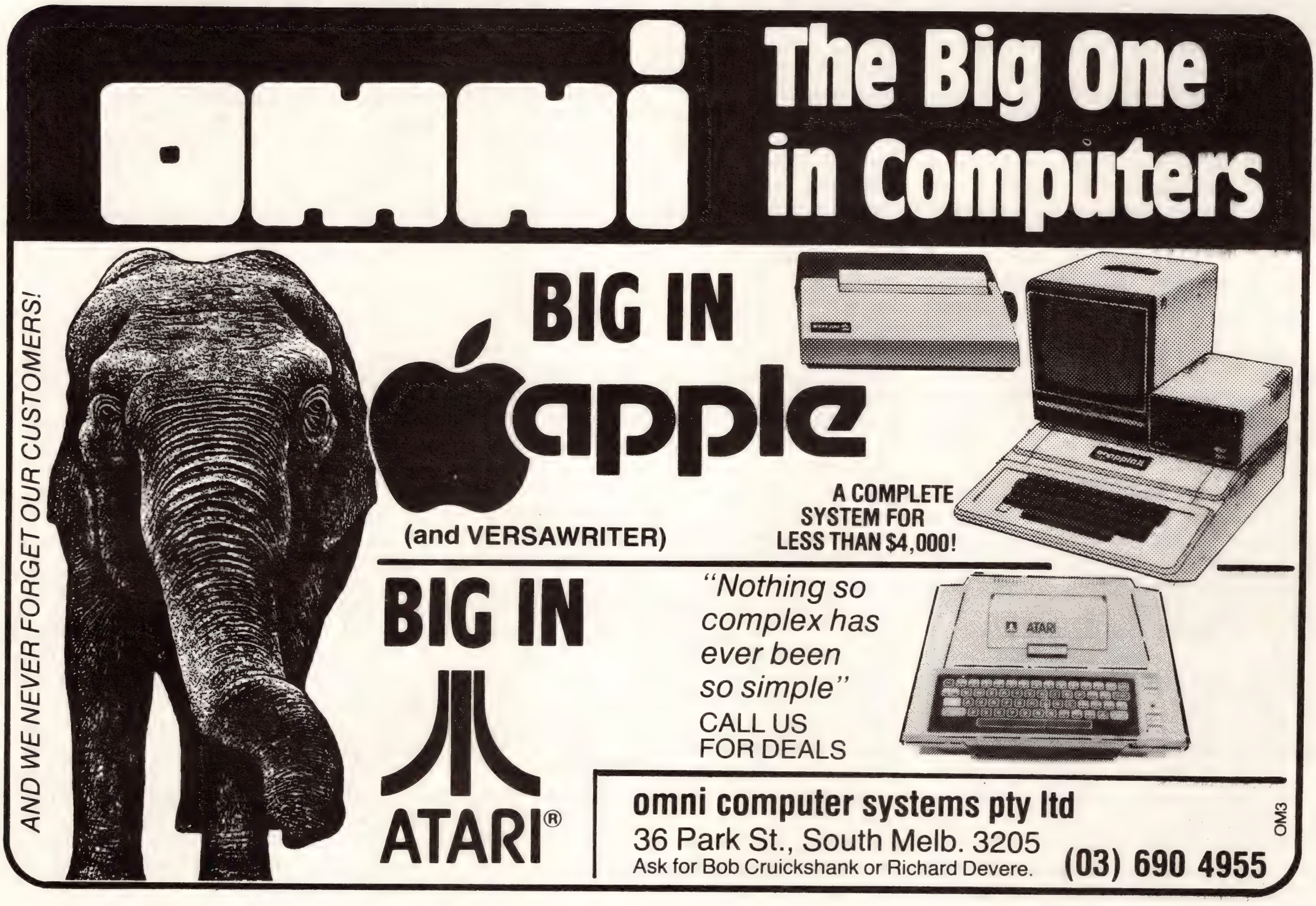
distinguish strategic play from tactical play. We have discussed this point before, with particular reference to chess and it is well known that the tree search should look deeper in those parts of the tree that are of greater tactical interest. In Go-Moku, tactical play is represented by threats, counter threats and moves that defend against threats. We have seen how the very existence of a 3-row constitutes a threat and it would be possible to argue that the creation of a 2-row is a veiled threat since the 2-row can easily grow into a 3-row. But I would recommend that we assume the evaluation function will be sufficiently smart to provide scores that represent fairly accurately the value of having a 2-row. It is the tactical value of a 3-row that is not so easy to measure and your program should therefore consider any move which creates a 3-row as being worthy of further consideration, even if it would otherwise be a terminal node.

My suggestion for a tactical search is to examine any move which creates or blocks a 3-row or a 4-row or which creates a 5-row. This means that having grown the tree to what would normally be its full depth, the program examines the board to see if any 3-rows exist and if so, whether the opponent can block them. The program also examines moves which themselves create 3-rows. It does the same for 4-rows and it looks for moves which create winning 5-rows. This process can, particularly during the later stages of the game, lead to a substantial increase in the size of the tree but tactics are extremely important in Go-Moku and it is essential for a strong program to have a good command of tactics. In order to be able to extend the tactical search to (say) 4 or 6 ply beyond the usual depth of search, it may be necessary to reduce the depth of the first part of the search. To ensure that your program responds within an acceptable amount of time, you should make your tree search iterative, with a mandatory cutoff after a certain maximum number of seconds. Your program might then perform a full 1-ply search, plus (say) 6-ply of tactical search; then if it has not consumed all of its thinking time it can sort the 1-ply moves as suggested above, prune off 90 percent of them, generate the replies to the remaining ten percent and then perform a 6-ply tactical search from the resulting positions at depth 2-ply. Once again, if the search time is not exhausted, prune 92 percent of the second ply moves, generate the third ply moves and perform your 6-ply tactical search. In order to optimise the performance of your program, try playing around with the various parameters (not only the weightings in the evaluation function, but also the percentage of moves pruned at each level and the depth of tactical search).

Bibliography

E W Elcock & A M Murray: 'Experiments with a Learning Component in a Go-Moku Playing Program', *Machine Intelligence 1*, N L Collins & D Michie (Eds), Edinburgh University Press 1971, pp 87-103.

A M Murray & E W Elcock: 'Automatic Description and Recognition of Board Patterns in Go-Moku', *Machine Intelligence 2*, E Dale & D Michie (Eds), Edinburgh University Press 1971, pp 75-88.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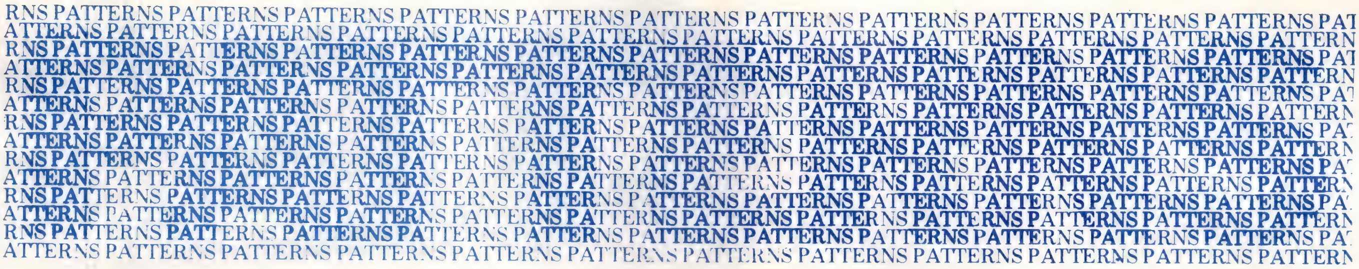


Alan Sutcliffe examines an area where art and computing meet.

Ken Knowlton has an exceptional combination of talents in computer science and graphic arts. By his own admission, he tends more to the science than to the art end of the spectrum. In a paper 'Collaboration with Artists — a Programmer's Reflections' he argues the need for a new breed of artist-programmer:

'. . . . A rather unlikely, or at least a rare phenomenon. I say this because, in my experience, artists and programmers are rather different groups. Both groups are creative, imaginative, intelligent, energetic, industrious, competitive and driven. But programmers, in my experience, tend to be painstaking, logical, inhibited, cautious, restrained, defensive, methodical and ritualistic. Their exterior actions are separated from their emotions by enough layers of logical defenses that they can always say "why" they did something. Artists, on the other hand, seem to me to be freer, alogical, intuitive, impulsive, implicit, perceptive, sensitive and vulnerable. They often do things without being able to say why they do them and one is usually polite enough not to ask.'

Now I do not altogether like these categories, though I have never read a better description of myself. Ken himself does not fit into either category now, even if he did when the article was written in 1972. He is one of the new breed of artist-programmer. This article is largely about Ken and particularly some of his latest work

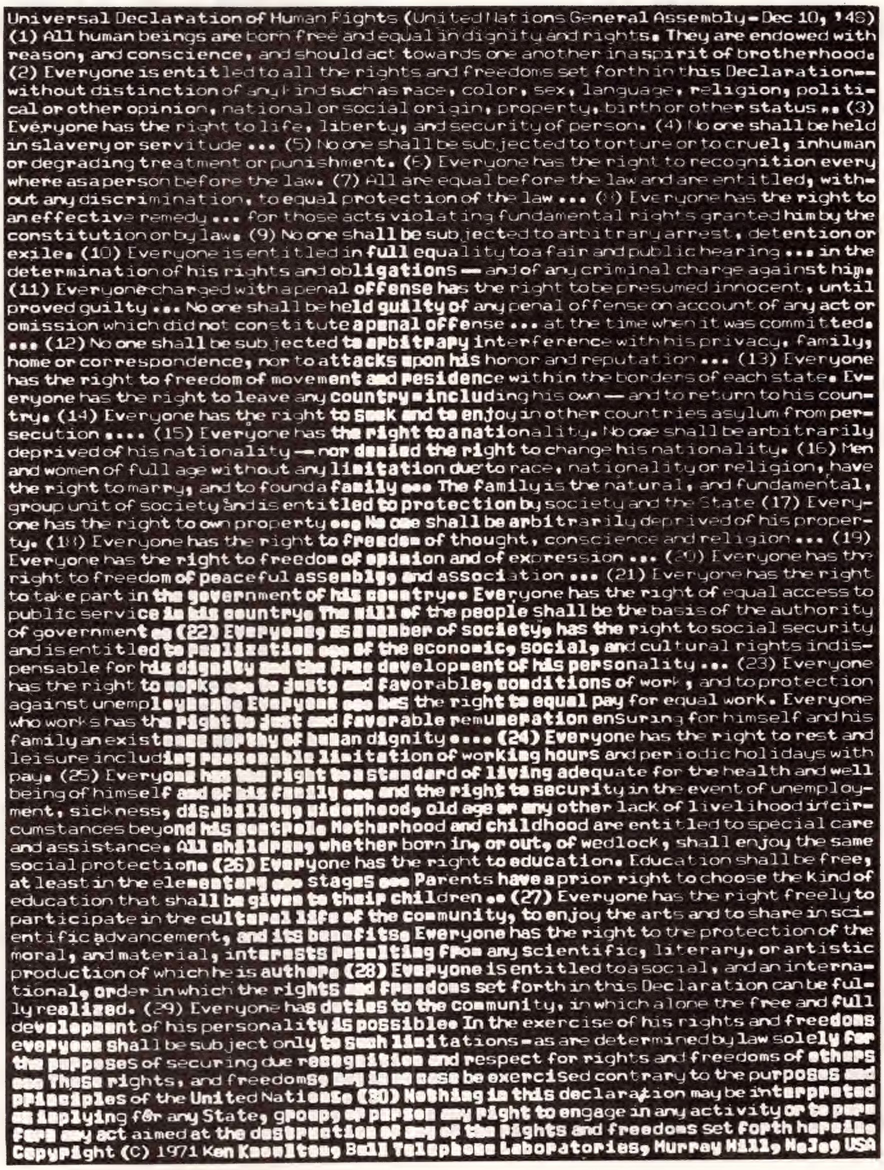
Kenneth C Knowlton has been for many years a scientist at Bell Telephone Laboratories at Murray Hill in New Jersey. His work is concerned with computing and particularly the man-machine interface: developing ways of inputting information that suits human skills, outputs that match human perception, rather than being simply what is convenient for the hardware or systems program. One very attractive device he developed is a keyboard on which the functions of the keys are redefined by software, depending what functions are allowable at a particular stage in the sequence of an operation. One implementation is for a telephone operator: the functions that can be used when a call is being set up are quite different from those when the charge is being sent to the subscriber's account at the end of a call. Appropriate symbols on the keys covered by the fingers are still visible. This system gives all the flexibility of a menu-driven sequence of operations, but directly on the keyboard, not displayed on a separate screen.

In the late 60s Ken worked with filmmaker Stan Vanderbeek, who certainly had many of the attributes of an artist listed above, and what I would call a truly Californian openness about what art is and how it might be made. The idea of using a computer in art was then quite novel and scorned by many.

There were two main outcomes from this collaboration. On one side the language Tarps, which might stand for Two-dimensional Alphanumeric Raster Picture System, itself written using Ken's earlier language Beflix. This is used to describe operations on a 92 x 126 array of characters. Individual cells and whole areas can be set to given values, and various kinds of transformation carried out on them, to produce forms and textures. By performing functions on a sequence of frames, motion for an animated film is produced. At Bell Labs there was sophisticated hardware for plotting directly onto film, but the same system could be used for printer output which could then be filmed.

On the other side, this collaboration produced the series of Poemfield films of concrete poetry and abstract designs. It is interesting for those who have seen the films to speculate how much of their quality comes from Vanderbeek's creative ability and how much their characteristic appearance owes to the language.

Ken has worked with many artists and the attribution 'X and Ken Knowlton' must appear for more values of X than almost any name in the history of creation. I think there are three main reason for this: the systems were



Universal Declaration of Human Rights (United Nations General Assembly — Dec 10, '48)
(1) All human beings are born free and equal in dignity and rights. They are endowed with
reason, and conscience, and should act towards one another in a spirit of brotherhood.
(2) Everyone is entitled to all the rights and freedoms set forth in this Declaration —
without distinction of any kind such as race, color, sex, language, religion, politi-
cal or other opinion, national or social origin, property, birth or other status .. (3)
Everyone has the right to life, liberty, and security of person. (4) No one shall be held
in slavery or servitude ... (5) No one shall be subjected to torture or to cruel, inhuman
or degrading treatment or punishment. (6) Everyone has the right to recognition every
where as a person before the law. (7) All are equal before the law and are entitled, with-
out any discrimination, to equal protection of the law ... (8) Everyone has the right to
an effective remedy ... for those acts violating fundamental rights granted him by the
constitution or by law. (9) No one shall be subjected to arbitrary arrest, detention or
exile. (10) Everyone is entitled in full equality to a fair and public hearing ... in the
determination of his rights and obligations — and of any criminal charge against him.
(11) Everyone charged with a penal offense has the right to be presumed innocent, until
proved guilty ... No one shall be held guilty of any penal offense on account of any act or
omission which did not constitute a penal offense ... at the time when it was committed.
... (12) No one shall be subjected to arbitrary interference with his privacy, family,
home or correspondence, nor to attacks upon his honor and reputation ... (13) Everyone
has the right to freedom of movement and residence within the borders of each state. Ev-
eryone has the right to leave any country — including his own — and to return to his coun-
try. (14) Everyone has the right to seek and to enjoy in other countries asylum from per-
secution .... (15) Everyone has the right to a nationality. No one shall be arbitrarily
deprived of his nationality — nor denied the right to change his nationality. (16) Men
and women of full age without any limitation due to race, nationality or religion, have
the right to marry, and to found a family ... The family is the natural, and fundamental,
group unit of society and is entitled to protection by society and the State (17) Every-
one has the right to own property ... No one shall be arbitrarily deprived of his proper-
ty. (18) Everyone has the right to freedom of thought, conscience and religion ... (19)
Everyone has the right to freedom of opinion and of expression ... (20) Everyone has the
right to freedom of peaceful assembly, and association ... (21) Everyone has the right
to take part in the government of his country.. Everyone has the right of equal access to
public service in his country. The will of the people shall be the basis of the authority
of government .. (22) Everyone, as a member of society, has the right to social security
and is entitled to realization ... of the economic, social, and cultural rights indis-
pensable for his dignity and the free development of his personality ... (23) Everyone
has the right to work, ... to just, and favorable, conditions of work, and to protection
against unemployment. Everyone ... has the right to equal pay for equal work. Everyone
who works has the right to just and favorable remuneration ensuring for himself and his
family an existence worthy of human dignity .... (24) Everyone has the right to rest and
leisure including reasonable limitation of working hours and periodic holidays with
pay. (25) Everyone has the right to a standard of living adequate for the health and well
being of himself and of his family ... and the right to security in the event of unemploy-
ment, sickness, disability, widowhood, old age or any other lack of livelihood in cir-
cumstances beyond his control. Motherhood and childhood are entitled to special care
and assistance. All children, whether born in, or out, of wedlock, shall enjoy the same
social protection. (26) Everyone has the right to education. Education shall be free,
at least in the elementary ... stages ... Parents have a prior right to choose the kind of
education that shall be given to their children .. (27) Everyone has the right freely to
participate in the cultural life of the community, to enjoy the arts and to share in sci-
entific advancement, and its benefits. Everyone has the right to the protection of the
moral, and material, interests resulting from any scientific, literary, or artistic
production of which he is author. (28) Everyone is entitled to a social, and an interna-
tional, order in which the rights and freedoms set forth in this Declaration can be ful-
ly realized. (29) Everyone has duties to the community, in which alone the free and full
development of his personality is possible. In the exercise of his rights and freedoms
everyone shall be subject only to such limitations — as are determined by law solely for
the purposes of securing due recognition and respect for rights and freedoms of others
... These rights, and freedoms, may in no case be exercised contrary to the purposes and
principles of the United Nations. (30) Nothing in this declaration may be interpreted
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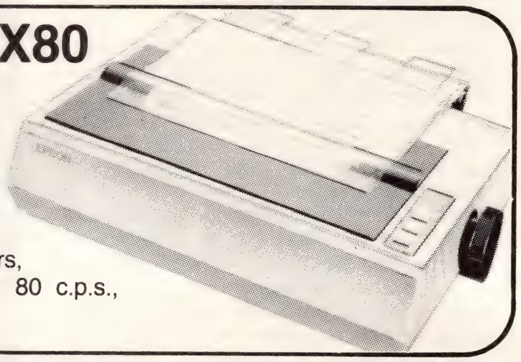

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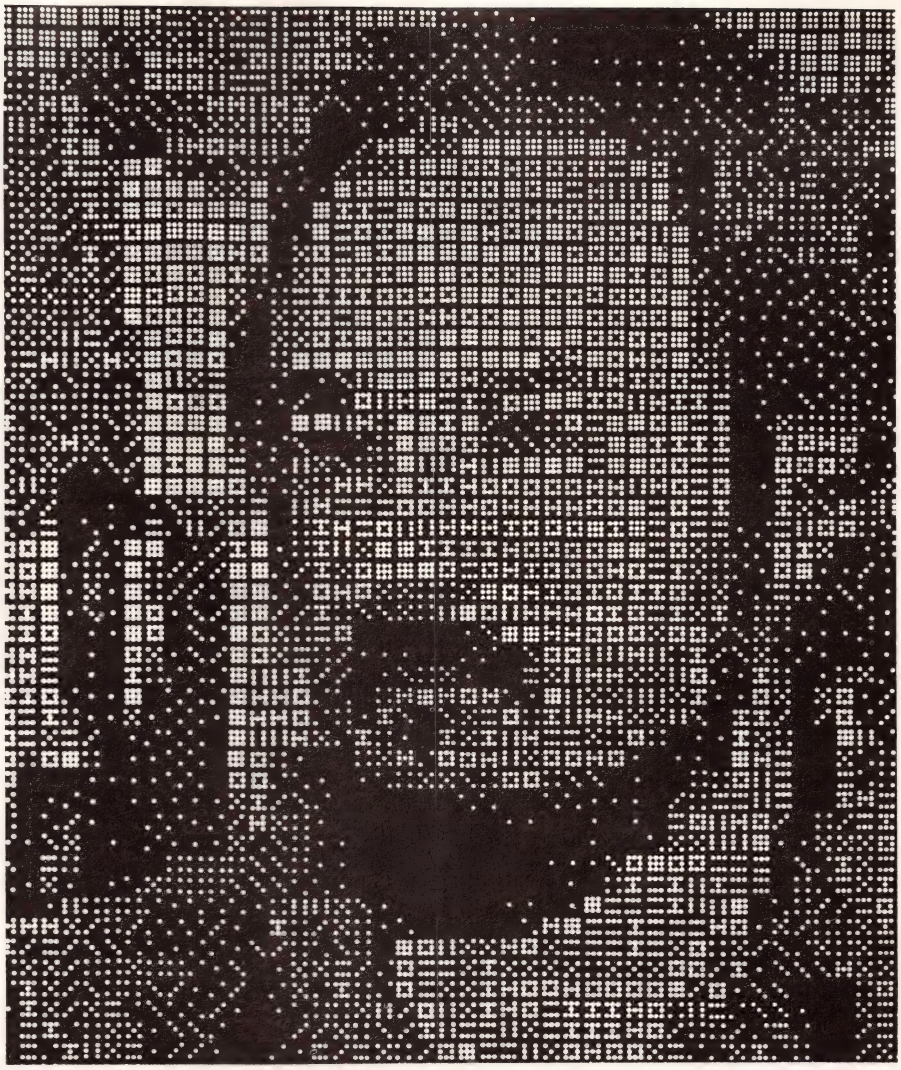

attractive to use, the environment at Bell Labs enabled artists to visit, and Ken himself is good to work with. But his most productive collaboration was with Lillian Schwartz, beginning around 1970. Again the outcome was a language and a series of films. Lillian and the films deserve an article to themselves. She has just completed two years work on a film of the archeological excavations at Carthage, which includes computer-processing of some images. She is currently in China filming the recently found and amazing tombs of the Han dynasty.

Explor

The language that Ken developed in 1970 was Explor, which stands for the basic ingredients of the pictures it produces: Explicit Patterns, Local Operations, and Randomness. It is a set of CALLs to Fortran subroutines. In it Ken corrected what he thought were some of the shortcomings of his earlier languages. I will just mention one important new feature: the local operations. As before, Explor acts on an array of cells, each one of which has a value. How this value is interpreted depends on the output medium, but usually it will represent grey levels, perhaps realised by using characters of different densities. But they could also be used to represent different colours.

In this context, the value of a cell can be affected by the values of its eight immediate neighbours, using the local operations. Each neighbour can vote for a change to the cell being processed and the votes can be weighted by numbers given in the program. This is like a powerful generalisation of Conway's famous game of Life. An enormously rich variety of effects can be obtained with these processes. A portrait, for example, which has been digitised and input can be blurred out of focus, have its contrast enhanced, or be transformed into an abstract pattern such as stripes or a checker-board.

In 1975 Ken produced Mini-Explor to run on the small machines of those days. I would like to see a version for today's micros.

Stills cannot do justice to these animation effects. Beflix can also be used for single graphics, and Figure 1 is one of the most striking of these. The text is abridged from the UN Declaration of Human Rights, and the original photograph is by Richard Swanson. From a distance it is clearly a portrait and equally clearly it is text when viewed closely. In between, our perception is torn between the two interpretations. As well as being very clever, I am sure that it is an important work of art, stemming from Ken's deeply held convictions.

Now for Ken's most recent work: Figure 2 is an example. Unlike all his earlier work that I have seen, it is not computer output, although it was designed with the aid of a computer. It is very heavy, as I found when I visited Ken recently and helped to move it into place for display. Some people see right away what it is, but even confronted with the original, others take some time to realise that it is constructed with dominoes. This array of 44x60 cells is made up from 24 complete sets of dominoes from double-0 to double-9 — 55 dominoes in a set.

Think for a few minutes how you would go about arranging one or more sets of dominoes to form a predetermined picture. Were the elements single cells, like the faces of dice, the problem would not be so horrendous. But they are linked together in pairs and there is a fixed quantity of each kind, depending on how many sets are used. If there are large blank areas in the picture, you may simply not have enough doubles to fill them. Equally, you may have far too many high-contrast tiles, such as 0-9, for the sudden changes of contrast in the picture. But this coupling of tiles must be taken into account from the beginning — it is no use assigning single half-dominoes to cells and hoping for the best. It is also vital to take into account the possible ways there are of arranging these two-cell tiles in an area. There is no point in almost filling a corner, say, and then finding that there is a single isolated cell into which a domino will not fit.

I have not fully understood Ken's method, but in part it goes like this: first choose your picture, one with about the right mixture of high, medium and low contrasts. Start the process of filling with the extreme valued dominoes: a complete set can be arranged in order in the form of a right angled triangle with 0-0 in the lower left, 9-9 in the upper right, and 0-9 at the right angle in the lower right. Start trying to assign the tiles from the corners of this triangle. The reason for this appears to be that these are the most characteristic parts of the picture, of highest and lowest contrast, and there is more error to the eye in substituting, say, 8-9 for 9-9 than there is replacing 4-5 for 5-5. Also, the extreme values have fewer alternative values nearby.

As the picture builds up, the critical part of the process comes: getting the best near-solution when an exact fit is no longer possible. First rearranging the existing dominoes can be tried to free one that is needed. If this does not work, then nearly the right domino must be used. Problem: when the picture is almost complete, how far back do you go taking it apart to get a possible small improvement?

Well, Ken has a program that does it and the proof is here for all to see. Now he is busy composing other pictures with it and an exhibition is planned in New York sometime in 1982. He did a 'sketch' for the big portrait here using just two sets of dominoes.

I am afraid that it has not been possible to do justice to the rich variety of Ken's work in this short article. No-one has done more for and with computers in the arts; no-one better deserves the title, Master of Patterns.

Next month, I will deal with a problem about dominoes that arose from talking to Ken. How many ways are there of filling a given rectangle with dominoes — face down — so that all the tiles are equivalent? I have got some answers to this. The next problem is: how many ways are there with the dominoes face up, so that they are all distinct? A report next month — in the meantime, you may like to work on it yourself.

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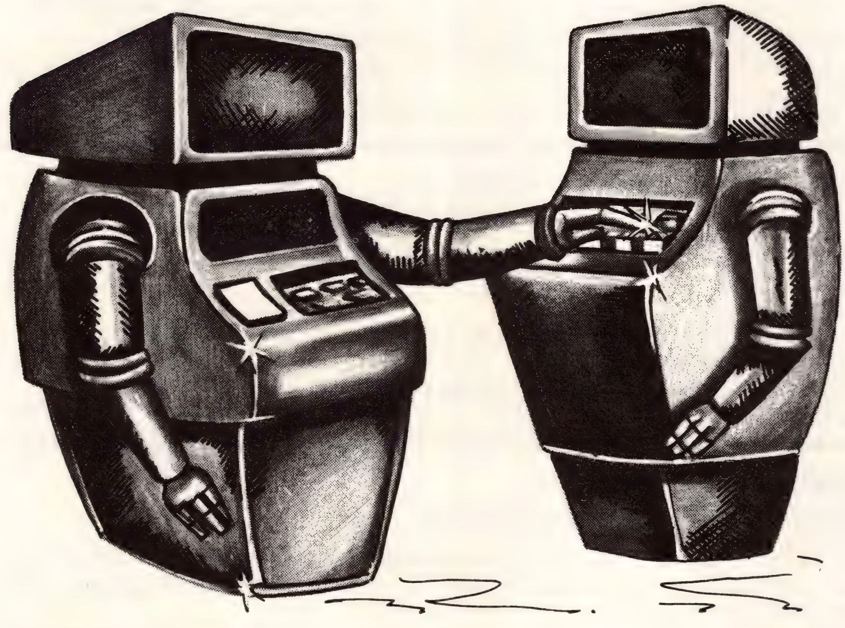


PART III

THE PARALLEL INTERFACE

by Hewlett Packard's Steve Leibson

Computers are information processing machines and thus require paths for raw data to enter and for processed information to exit. In modern computer design, a very common technique is to create one universal path that leads both into and out of the processor. That path is the I/O bus.

This concept simplifies computer design but brings a complication: whatever the design of the I/O bus, the computer will be incompatible with a large number of peripheral devices. Some will be too old and use different signal levels, some will have varying data formats and most will be slow enough to seriously degrade the computer's performance if it must wait on every data transaction.

The complication is solved through the use of interfaces which act as transformers of voltage levels, data formats and transaction speeds, thus allowing a computer to communicate with a vast array of peripheral devices.

DATA LINES IN PARALLEL

A very simple peripheral will often have interface requirements which are very similar to the I/O BUS. Data is transferred over a set of data lines using a signal line to indicate when the next chunk of information is ready. The peripheral indicates its readiness to accept another piece of data on another signal line.

This type of interface is a parallel interface, so-named because the data lines are in parallel and data is transferred several bits at a time. The HP 98032A is a 16-bit parallel interface designed for use with the Hewlett Packard computers which have the I/O bus described last month, we will be using it as the model for our discussion of parallel interfaces.

The I/O bus has 16 bidirectional data lines. Data is handled in 16-bit chunks and flows over these lines either into or out of the computer, but not in both directions at the same time.

The 98032A splits the I/O bus into two sets of data lines. The configuration is more compatible with unidirectional peripherals. Unneeded lines are left unconnected. Out of 32 data lines only eight might be used by a unidirectional, eight-bit peripheral.

As mentioned above, interfaces are sometimes used to transform voltage levels used on a computer I/O bus to those required by a peripheral. Our I/O bus uses "TTL" levels meaning that a low level is represented by a voltage between 0 and 0.7 volts and a high level is between 2.0 and 5.5 volts. Since the input lines of the 98032A parallel interface are built using TTL integrated circuit logic, these voltages are required on the data inputs of the interface to represent high or low logic levels.

The data outputs have been built with transistors, however, and can withstand 30 volts for a high level. The low level is still around zero volts. Remember when discussing logic signal lines that only two signal levels are allowed, one designated high and the other low. If the high level corresponds to a logic one, the signals are said to be positive-true logic. If a low level signal corresponds to a logic one, it is called negative-true logic. Logic zero would correspond to low or high levels respectively.

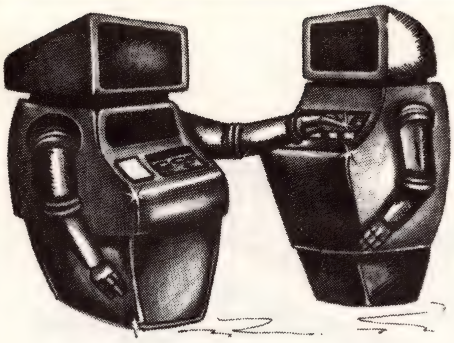
We have now established:

1. The I/O bus data lines, which are the conductors used to transfer data between the computer and the interface.
2. The interface input and output lines, which are the conductors used to transfer data between the interface and the peripheral.

Handshake lines serve to synchronize the interface and the peripheral. The meaning of each line depends on the direction in which data is flowing.

REGISTER ARCHITECTURE

In the previous article, we established that each interface would have a unique address on the I/O bus and would be selected via the peripheral address lines of the I/O bus. Each interface was further subdivided into registers which could be individually addressed by a register code. The register model contains eight registers. Four of the registers are output registers, receiving data from the computer. The remaining four registers are input registers, supplying data to the computer. Each register has a special function which is defined



by the interface. The 98032A Interface makes the following definitions:

Input Registers

Register code	Function
R4	Data input
R5	Interface status
R6	High byte data input
R7	(Not used)

Output Registers

Register code	Function
R4	Data output
R5	Interface control
R6	High byte data output
R7	Data transfer trigger

The R4 registers are the primary means of data transfer in the interface. The R4 OUT register is directly connected to the interface output data lines and the R4 IN register is connected to the interface input data lines. When the computer places information into the R4 OUT register of a 98032A interface, the data pattern appears on the data output lines. A reading of the R4 IN register provides an image of what is in the interface's R4 input register which may or may not represent the current state of the interface's input data lines.

Note that the R7 OUT register is called the data transfer trigger. When used in conjunction with the R4 registers, the R7 OUT register forms a handshake mechanism which effects data transfer between the fast computer and the slower peripheral.

Before discussing data handshake, however, four more registers need to be discussed. The R5 IN register contains several pieces of important information. Only the lower eight bits of this register have been implemented. The meanings of these numbered bits are as follows:

Interface status (R5 IN) register

7	6	5	4	3	2	1	0
INT	DMA	1	0	IID	IOD	STI1	STIO

The INT and DMA bits are used for I/O operations called interrupt and direct memory access respectively. These are advanced I/O techniques and will be discussed later in this series.

Bits five and four are interface identification bits. The 10 pattern identifies the 98032A interface as a type two interface, 10 being two in binary notation. Software in the computer uses the interface identity to decide how to communicate with the interface.

The IID and IOD bits are also used by the computer software. IID stands for invert input data while IOD stands for invert output data. These bits allow the computer-interface combination to communicate with peripherals using either positive-true or negative-true logic on the data lines.

The peripheral handshake.

It is important to note that the data inversion occurs in the computer and not in the interface, and that the computer may choose to ignore these bits in certain classes of I/O operations.

ANOTHER TWO BITS

The two remaining bits of the interface status register, ST11 and ST10, are directly connected to two input lines. These two lines are general purpose and can be used for any user-defined function.

Interface control is effected through the R5 OUT register. The bit pattern for this register is as follows:

Interface control (R5 OUT) register

7	6	5	4
INT	DMA	RESET	AHS

3	2	1	0
X	X	CTL1	CTL0

The INT and DMA bits are used in the interrupt and direct memory access modes mentioned earlier. The RESET bit is used to place the interface in the initial, power-on state. In addition, when the RESET bit is set, a reset signal is sent out on one of the 98032A peripheral lines.

The AHS bit is the auto handshake bit. When this bit is set, the R7 DATA TRANSFER TRIGGER is not needed. This mode is useful for higher speed operations and is usually used by the internal software only. Bits three and two are unused.

The CTL1 and CTL0 bits are directly connected to output lines. These lines are separate from the output data lines and may be used to control the peripheral device. Such an application might be to latch the door of a printer while it is printing.

The R6 registers are data registers similar to the R4 registers. When the 98032A is set to the "byte" mode, the upper eight of the 16 data lines, in both directions, are allocated to the R6 registers instead of the R4 registers. This splitting of the two sets of 16 data lines into four sets of eight data lines is useful for some peripheral devices with unusual protocols.

PERIPHERAL HANDSHAKING

Placing data on the output lines or reading the levels of the input lines connecting the interface to the peripheral device is not sufficient for smooth data flow. A set of signals signifying "new data ready" and "ready for new data" is needed.

These two lines are called handshake lines and serve to synchronise the interface and the peripheral. Each controls one line, but the meaning of the line depends on the direction in which data is flowing. We will call the line controlled by the interface PCTL for peripheral control and the line controlled by the peripheral PFLG for peripheral flag. We now have enough connections between the interface and the peripheral to discuss handshaking.

DATA OUTPUT

Output is the simpler of the two data transactions. As mentioned before, the computer may place information in the R4 OUT register, setting the interface data output lines. It may then perform an R7 OUT operation, starting the handshake mechanism.

The interface recognizes the R7 OUT operation and causes the PCTL signal line to change from the clear state to the set state. The transition is a signal that "new data is ready" and that the peripheral should accept this new data.

The peripheral responds by changing the PFLG line from ready to busy, signifying that the data has been recognized and is being processed by the peripheral.

From the time that the computer performs the R7 OUT operation to the time that the peripheral returns to the ready state after processing the information, the interface is busy transferring the information placed in its R4 OUT register.

It is extremely important that the computer not access the R4 OUT register before the transaction has been completed. For this reason, the interface and the computer have a handshake mechanism also. While the

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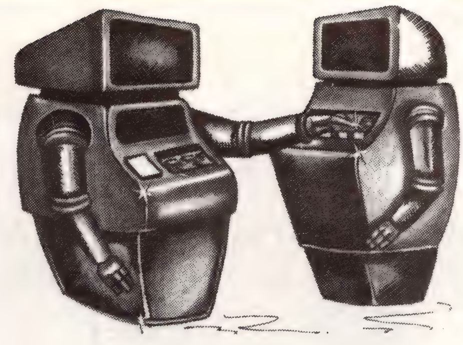

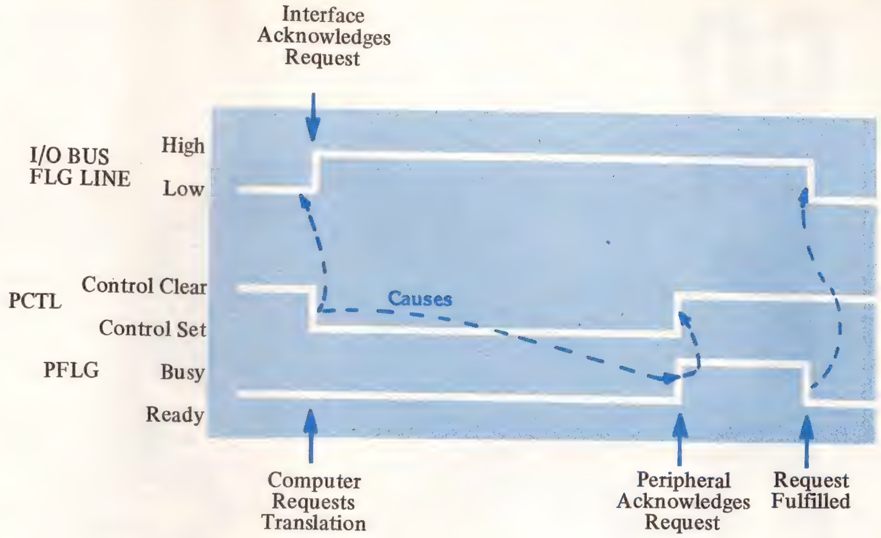

Handshaking between the computer and the interface, and between the interface and the peripheral involves the same basic sequence of events. The diagram shows related changes on three key lines.

interface is busy with a transaction, it will indicate this situation to the computer on the interface flag line.

DATA INPUT

Data input from a peripheral is a slightly more complex operation because it is a three-step transaction. The computer first performs an R4 IN operation, reading the interface's R4 IN register. This operation is a dummy, and the information obtained is discarded because the interface did not have time to request a piece of information from the peripheral. The initial R4 IN serves to place the interface into the input mode and to set the peripheral I/O line to input.

The computer then performs an R7 OUT operation. As in the data output transaction, this causes the interface to set the PCTL line, signifying to the peripheral device that a piece of data has been requested.

The peripheral signals that it is busy and performs whatever operations are necessary to obtain the requested data input lines and sets the PFLG line to ready.

When the peripheral returns to the ready state, the transition on the PFLG line holds, or "latches" the states of the data input lines into the R4 IN register and causes the interface to signal ready on the flag line. The computer, which has been waiting for the interface to signal ready, now performs a second R4 IN operation. The transaction is complete.

"LATCHED" LINES

There may be times when peripherals are so simple that they are incapable of performing the two-wire handshake. In these instances the PFLG and PCTL lines may be tied together so that the interface handshakes with itself. This results in 16 "latched" output lines and 16 input lines which may be read on demand.

Most peripherals using the parallel interface use only eight bits. This allows two raised to the eighth power or 256 combinations. If these combinations are treated as character codes, then numerals, upper and lower case letters, punctuation marks and other characters can be represented.

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GO FORTH AND MULTIPLY

JOHN STOREY

Mike Curtis explains the features of Forth which make it an ideal language for small systems.

Basic has done for microcomputing what Henry Ford did for the motorcar; that is, made it easily and cheaply available to a large number of people. There comes a point in the education of many microusers, however, where an urge is felt to branch out into other languages; this step gets more feasible by the month as compilers and interpreters become available for languages hitherto unavailable on micros. Pascal, Lisp, C, PL/I, APL, Forth, Cobol, the list goes on.

Some users will opt for a language with more sophisticated control structures and more readable code, such as Pascal or Comal, others for the speed and economy of Assembler. Standing at this fork in the road between higher and lower level languages, many people have overlooked a less distinct third path, the language Forth.

Developed in the middle 1960s for instrument control applications, it was initially only available on mainframe and minicomputers from Forth Inc, a company set up by its inventor Charles H Moore and his early collaborators. The name came from Fourth generation computer language; unfortunately the Third generation IBM 1130 on which it was developed only allowed Five character identifiers. The news spread and it developed a devoted 'underground' following among groups who have propagated the language by writing and distributing Forth systems for micros among themselves. Now Forth is beginning to appear 'off the shelf' for many machines and seems destined to join the shortlist of popular microlanguages.

The attraction of Forth's 'middle road' for micro applications is that it combines a speed and memory economy comparable to Assembler with a novel modular program structure which, once mastered, allows much more rapid program development than many high level languages, let alone machine code. The price paid is that the source code is not as readable as Pascal or even Basic, and that many facilities taken for granted such as strings, arrays and floating point arithmetic are not initially provided (though they can be added at will once you become fluent). How this happens will only become clear after a little discussion of Forth's unique structure, which is so different from sequentially executed languages like Basic and Pascal that it will provoke quite a major mental reshuffle. In particular you will have to abandon any concept of what constitutes a 'program' derived from Basic. At the heart of Forth is a 'dictionary' of around 100 'words' held in memory while the system is active. Fifty or so of these words define machine code routines which are linked and executed when the word is invoked; the remainder are defined in terms of these words. Words have names, like ALLOT, ECHO or +. This concept of defining words using previous definitions is crucial to the operation of Forth and is (this is a crude simile) similar to writing a Pascal program as a cascade of nested procedures. The activity of the programmer in a Forth system consists of defining new words which perform functions required in his final application. Once defined these new words are compiled into the dictionary and become just as much a part of Forth as the 'core' words. They can be tested immediately in direct mode, at the keyboard. The programmer then defines 'higher level' words in terms of these words and so forth (ouch!) until his final 'program' typically consists of a single word. When this word is executed, one of Forth's interpreters looks at its dictionary entry which contains pointers to the words by which it was defined. These in turn contain pointers to the words by which they are defined and so on down to the level of the machine code 'core' words. Each word is 'executed' as it is found so that Forth is neither interpreted nor compiled in the traditional sense, it is both. Thus, Forth enforces the 'top-down' development of programs beloved of structured programming proponents. The source listing of a Forth program consists of a series of definitions of new words (all of which are independently executable) leading up to the final application. These blocks of code could be loaded from disk or tape during development together with the Forth 'core', but for crucially memory conserving applications, such as industrial control, anything not needed on the run (which includes the compiler and unused dictionary entries) may be stripped away leaving a minimal necessary system for the job; this may be burned into ROM and can typically occupy as little as 800 bytes.

A great beauty of Forth is then its extendability or contractability. The user extends the language himself in the directions which he requires, or pares the system down to target on a specific application. Having written a Forth program, it is likely that many words created will go on to be used in future programs.

Forth is more than just another programming language, it can be an operating system, incorporating its own compiler, interpreter, assembler, text editor and a rudimentary file management system; in short it provides a complete environment for the writing, testing and using of programs. Basic, of course, also provides such an environment, though not so comprehensive, but Forth has a number of distinct advantages over Basic.

The speed of execution of a Forth program is very much greater than an equivalent Basic program, of the order of ten times as fast. A 16-bit machine should execute a Forth program at virtually the same speed as ordinary machine code, and an 8-bit machine should only be slightly slower. A good compiled Basic may be as quick in some applications but it is always possible to use the assembler option and write Forth definitions directly in machine code where speed is really important.

The amount of memory required by a Forth application is also usually much less than with other systems; as with Basic the entire Forth system is resident in memory the whole time; on most systems, however, this only requires 6-8k, and that includes the space for the compiled programs. A little more space is required for disc I/O buffers, or pseudo-disk in a cassette-based system, but this means that a really good Forth system can be fitted into 16k!. Compare this with the 48k at least for a decent Pascal system.

Forth is by its very nature modular, interactive and structured; there is no equivalent to a GOTO statement and it is almost impossible to think of an occasion where one could be used. The modular and interactive nature of Forth is particularly useful and important as it means that a program can be developed in small sections which can be seperately compiled and tested before using them in larger modules. In practice this leads to a much quicker program development time and fewer bugs. Experience has shown that one should be able to at least halve this time compared to Basic.

The final advantage of Forth, and the one that many feel is the most important, is that the Forth system itself is written in Forth. There are usually only a few bytes that are outside the dictionary, so that the programs that you write, or the words that you define are treated in exactly the same way as the words that are already there. When Forth is searching for a word in the dictionary it starts with the most recent definitions, which gives you the option of redefining any of the system words, or defining your own control structures. A Forth program is, in effect, better thought of as an extension of the system to provide commands and facilities suitable to your application.

This does lead us to one of the disadvantages of Forth: it can be very easy to crash and this is one of the penalties of having the system so open to the user. Some of the more sophisticated systems do have some protection built in, and it is always possible to add your own, but a certain amount of fragility is a natural consequence of the nature of Forth. It is usually easy enough to recover from such a crash without too much damage being done, but if it is bad enough to need a complete reload and you are using 300 baud cassettes. . .!

The other main disadvantage of Forth, at least as far as beginners are concerned, is its extensive use of stacks and postfix (reverse polish) notation. The difficulty that many people have with this is usually more imagined than real; though there is no doubt that a language like Basic is easier to learn initially, anyone who understands the basic principles of programming should be able to master Forth without much difficulty.

Stacks

A stack is best thought of as a pile of objects, a common analogy being that of a pile of plates or trays in a canteen. Objects can only be added to the top of the stack, and the only object that can (safely) be removed is the top one. The objects on the Forth stack are 16-bit numbers and the stack provides a convenient place for temporary storage, since the user doesn't have to concern himself with where the numbers are stored, only with the order in which they are stored. Placing a number on the stack is known as PUSHING and removing it is known as PULLING — see Figure 1 for an example.

Part of the documentation for a Forth word should be its effect on the stack, eg, + (n1 n2. . . . . .sum) indicating that the Forth word '+' expects to find two numbers n1 and n2 on the stack. n2 is on top and the effect of that word is to pull the two numbers from the stack and to push their sum back on.

Postfix notation fits in very naturally with stacks: it involves writing an operator after its operands, so we write 2 3 + instead of 2+3 in ordinary infix notation, or B C + A * instead of A*(B+C). Each operand is pushed onto the stack as it comes, each operator pulls its operands from the stack and pushes its result back on.

It is now possible to have a look at some Forth; if the following sequence is entered at the keyboard:

4 5 + (return) OK (OK is the Forth response, output on the same line before the carriage return is echoed) will result in the two numbers 4 and 5 being pushed on the stack, then the + pulls them off, adds them and pushes the sum back on. To see what is on the stack we use the Forth word '.' which prints the top number so:

```
. (return) 9 OK .
```

Try this

```
HEX F 2 *. (return) 1E OK
```

(Warning: everything will be done in HEX from now on until you enter DECIMAL)

Some Forth words do nothing but manipulate items on the stack, eg:

DUP	(n1 . . . . .n1 n1) duplicates the top item on the stack;
SWAP	(n1 n2. . . . .n2 n1) swaps the top two items around;
OVER	(n1 n2. . . . .n1 n2 n1) copies the second item onto the top;
ROT	(n1 n2 n3. . . . .n2 n3 n1) rotates the third item onto the top;
DROP	(n1. . . . .) drops the top item.

Dictionary

The major difference between Forth and languages like Basic lies in its use of a dictionary and Indirect Threaded Code (ITC). Direct Threaded Code (DTC) means that a program consists of a list of addresses of pre-written routines; in ITC a program consists of a list of addresses of addresses of routines. Provided that the pre-written routines are sensibly chosen so that every programming need can be met by some combination of them, then both methods produce particu-

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FEATURES

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larly efficient programs because the routines act like a high-level instruction set for the processor, and are themselves usually written in machine code. You thus get a combination of high-level programs running at very nearly the speed of machine code, with the advantage over normal compiled languages that each routine, no matter how complicated, reduces to a two byte address, so the programs do not use up much memory. The advantages of ITC over DTC are not so clear, and beyond the scope of this article, but it makes it easier to treat the programs as routines that can be included in other programs. Forth has, in fact, been implemented in DTC, but the use of ITC is now almost universal.

A Forth dictionary entry contains the following information:

— A name field, which contains the name of the routine (there is very little restriction on the choice of name) and a few other details, such as the length of the name.

— A link field which contains a two-byte pointer to the preceding entry, used when the dictionary is being searched.

— A code field which contains a two-byte pointer to actual machine code which could be the next part of the entry (a code definition), or to a routine that interprets the rest of the entry.

— A parameter field which may contain machine code, addresses of other dictionary entries, variable values, or other information depending on the type of entry.

Writing a Forth program involves the creation of a new dictionary entry, whose parameters are the addresses of the other words that go to make up the new word. There are a number of different ways of doing this, the most common being the COLON definition; the Forth word ':' having been defined to create a new dictionary entry. The word ';' is used to terminate a definition, eg, to convert a temperature in Centigrade to Fahrenheit we must multiply by 9, divide by 5 and add 32. We can define a word 'DEGC=' thus:

```
    : DEGC= 9 * 5 / 32 + . .“   DEGF” ;
```

Note the use of spaces; Forth uses spaces as a delimiter so there must be at least one space between every word. The word '." ' prints the character string following up to the next ". Note also that there must be a number on the stack before this word is executed since the '*' requires two numbers to be on the stack. The word 'DEGC=' has now been added to the dictionary and may be used in just the same way as any other word; either in subsequent definitions or directly interpreted from the terminal thus:

```
      10 DEGC= (return) 50 DEGF OK
or    12 DEGC= (return) 53 DEGF OK
```

from which you may gather that Forth uses integer (fixed point) arithmetic. There is no standard method of dealing with floating point numbers in Forth, though a number of routines have been published. Many people think that this is another disadvantage of Forth, but in practice most Forth programmers don't find it much of a restriction; there are a number of useful words available for integer arithmetic, an example being /MOD (n1 n2. . . . .rem quot) which leaves on the stack both the remainder and quotient after a division. Forth also has words for dealing with double length (32-bit) numbers and, at the expense of a little more thought, these give faster, more accurate results than floating point arithmetic.

Variables are not so widely used in Forth programs, since the stack is used for temporary storage; any that are needed must first be defined as dictionary entries, thus:

```
      0 VARIABLE X (return) OK
```

which defines a word X as a variable whose parameter field is two bytes long and may be used to store any 16-bit value. When the word 'X' is executed its effect is to leave the address of this parameter field on the stack; values may be stored and retrieved using the words '!' (pronounced store) and '@' (pronounced fetch). X @ will place the value stored in X onto the stack. While X ! will place the current top of the stack into X.

Other types of variable are possible, but it is up to the programmer to allot enough space in the dictionary (using the word ALLOT) and to write the words necessary to access their values. For example a simple one-dimensional array of ten 16-bit numbers could be defined by:

0 VARIABLE ARRAY 18 ALLOT (18 bytes + 2 bytes assigned by VARIABLE). Execution of the word 'ARRAY' will also place the address of the parameter field (the first element of the array) on the stack, but the word 'ARRAY' could be redefined to access all the elements thus:

```
  : ARRAY 1 — 2 * (to work out the byte offset)
      ARRAY (uses the previous definition to get the address)
      + ;
```

Now, for example, 3 ARRAY will put the address of the third element on the stack. There are other ways of doing this with only one definition, using one of the other methods of creating a dictionary entry, but this is perhaps the easiest to understand.

The usual control structures are available, with the exception of a CASE construction, though there are a number of published versions of this. The major ones are:

IF (true clause) ELSE (false clause) ENDIF

where the ELSE and the false clause may be omitted;

DO (routine to be repeated) LOOP

which is the equivalent of a FOR. . .NEXT loop in BASIC, with a variation using +LOOP for an increment which is not 1;

BEGIN (condition) WHILE (routine) AGAIN

BEGIN (routine) (condition) UNTIL

which should be self-explanatory.

Here is an example which illustrates the IF and DO. .LOOP constructions, and also shows the way in which a program may be built up in modules. Suppose our ARRAY contains ten marks in an exam, and results must be printed out as PASS (45 per cent or over) or FAIL. First we define a word 'GRADE' which will test the number on top of the stack and print the appropriate message.

```
   : GRADE 45 < (pulls the top two numbers and pushes a 1
                  if the second is less than the top, 0 otherwise )
      IF ." FAIL"
      ELSE ." PASS"
      ENDIF ;
```

This can now be tested by, for example:

```
   62 GRADE (return) PASS OK
```

and it can be then incorporated in:

```
   : GRADES 11 1 (the DO LOOP index, performed ten times, 11
                   is the value at which it will exit)
      DO
         I ARRAY @ (I pushes the index onto the stack)
         DUP . (to print the mark) 5 SPACES
         GRADE CR (to do a carriage return)
      LOOP ;
```

To sum up, Forth is not a language for absolute beginners, but it has so many advantages over Basic and similar languages that it should be seriously considered by anyone else.

Note. Forth Dimension distributes a lot of material, including Assembler listings for all major microprocessors. Its address is: Forth Interest Group, PO Box 1105, San Carlos, CA 94070, USA.

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DESIGNING PROGRAMS THE WARNIER WAY

Here's a really neat way to design programs quickly and logically, described by Paul Overaa.

There's a lot more to writing a program than the physical effort of putting it into code, whether you're using Basic, Pascal or any other programming language. Unless the program is very short and simple, your first action must be to *design* it — work out the underlying sequence and logic. Without doing this, you can end up in a frightful mess.

The program design stage can often be more difficult than the actual coding; or, put another way, by properly designing the program before you start coding, the coding itself becomes very much easier because you have a clear mental picture of what you're doing at each stage in the program. Producing logical, well-structured programs which actually do exactly what you wanted them to thus hinges around good program design.

A program design technique must, if it is to be useful, satisfy several criteria: it must produce consistent results of high quality; it must be quick; it must allow easy program maintenance and it must be simple enough for anyone to use it and produce good results.

If these criteria look as though we're waiting for some really handy program design technique of the future, then relax — just such a technique is here already.

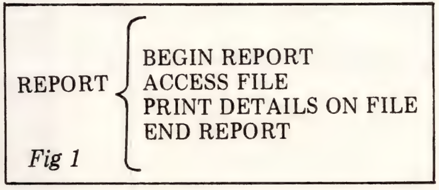

Fig 1

Warnier-Orr techniques were pioneered by Jean-Dominique Warnier in France and their use has been expanded and publicised by Kenneth T Orr in the US. The method is a major step forward in the design of logically structured programs.

Before we look in detail at the techniques, I should emphasise that during the design stage, it's vital to forget about your computer completely — and the programming language you're going to use! These are things which will affect how you code your program but they should not influence your logical solution to the problem.

Programmers are using Warnier-Orr techniques to design programs which are then written in Basic, Cobol, Fortran, APL and assembler languages as well as many other languages; all agree that the techniques result in easy to understand, well-structured programs (yes, even in assembler!).

The technique uses diagrams — called Warnier Diagrams — that are basically a series of hierarchical 'curly brackets'. The best way to learn to understand these diagrams is to see them being used in specific cases, so let's consider a very simple example.

For some purpose or other, we have to print a report comprising the contents of a disk file. The Warnier diagram of this is shown in Figure 1. Notice that the bracket is read from top to bottom and that the word 'report' on the left-hand side identifies what we're doing in the bracket. Notice also that we explicitly state at the top and bottom of the bracket that there is a beginning and an end to the operation.

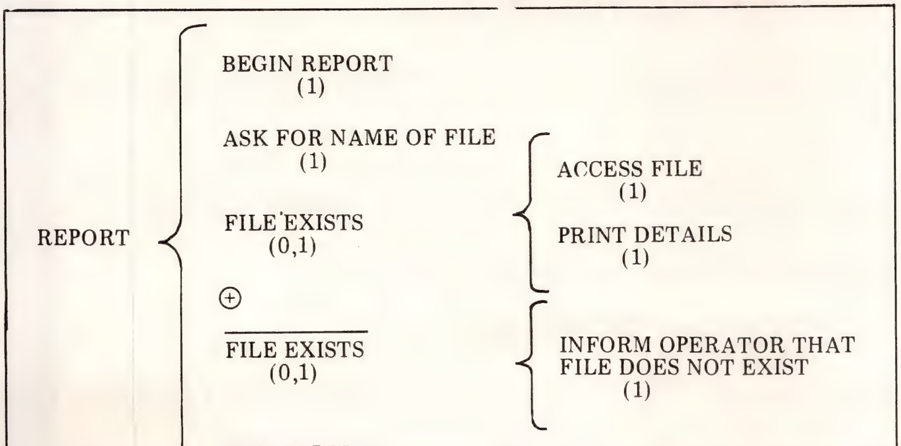

Fig 2

To explain some further conventions, let's now introduce a minor complication to the problem: the user will wish to access a file of his own choosing and obtain a printed report of details present. Such a file may not in fact exist and if this is the case, the user should be informed.

Figure 2 shows the problem in Warnier diagram form. The following conventions are used: the ⊕ sign is used to separate mutually exclusive operations — in this example, a file either exists or doesn't; the logical opposite of a statement is written with a bar over it — $\overline{\text{FILE EXISTS}}$ means that the file does *not* exist; brackets written to the right of an item or statement indicate the operations to be carried out; underneath each item or statement is a number in parentheses which indicates how many times the operation is to be performed — (1) tells us that the operation is performed once and (0,n) tells us that the operation is to be performed any number of times from not at all to n times.

Having now dealt with the basic conventions of Warnier diagrams, we can express in plain language exactly what the diagram tells us: we are dealing with a certain procedure called REPORT which starts by asking us for the name of a file. If the file exists then we can access it and print out the details; if it does not exist then the operator is informed of that fact.

To appreciate the elegance and speed with which this technique can accommodate changing requirements within a particular problem, let's place some additional restrictions on our example: the user must be able to access a file of his own choosing and a report of the contents of this file is to be printed; such a file may not exist and if this is the case, the user must be so informed. In addition to this, there are within our hypothetical system various files containing sensitive information, such as wages or personnel details, which must only be made available to those users with the proper authority — users are therefore issued with access code numbers. If a user tries to access a file which he has no right to examine, two operations must be carried out: the user must be informed that he has tried to access data to which he is not permitted access; and the system security officer must be informed of a possible attempted illegal access.

The Warnier diagram for this new condition is shown in Figure 3; pay particular attention to the layout of

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SEE THIS MONTH'S "YOUR COMPUTER" FOR ADDITIONAL ITEMS IN OUR RANGE this diagram and compare it to Figure 2, the example without the additional restrictions.

Notice that as we redefine the problem and add more details, we don't have to re-arrange the complete diagram, as we would have to with a flowchart. All we do, in fact, is superimpose the new details and restrictions onto the existing diagram, which grows as we successively modify the requirements. In addition, the diagram is documenting and expressing the logic of the problem in a way which will actually make the transition to a language-coded equivalent very straightforward.

The ability of these Warnier diagrams to display, help formulate and to grow with the changing logic of a problem is of great importance. Once the quite simple conventions have been learned, these diagrams can be read just like the written plain-language equivalent but, unlike the plain language form, a Warnier diagram contains within its apparently simple notation the complete logical solution to the problem!

I don't intend to discuss the coding of the solution in this article, other than by giving a very general pseudo-Basic type of program based on the example we have developed.

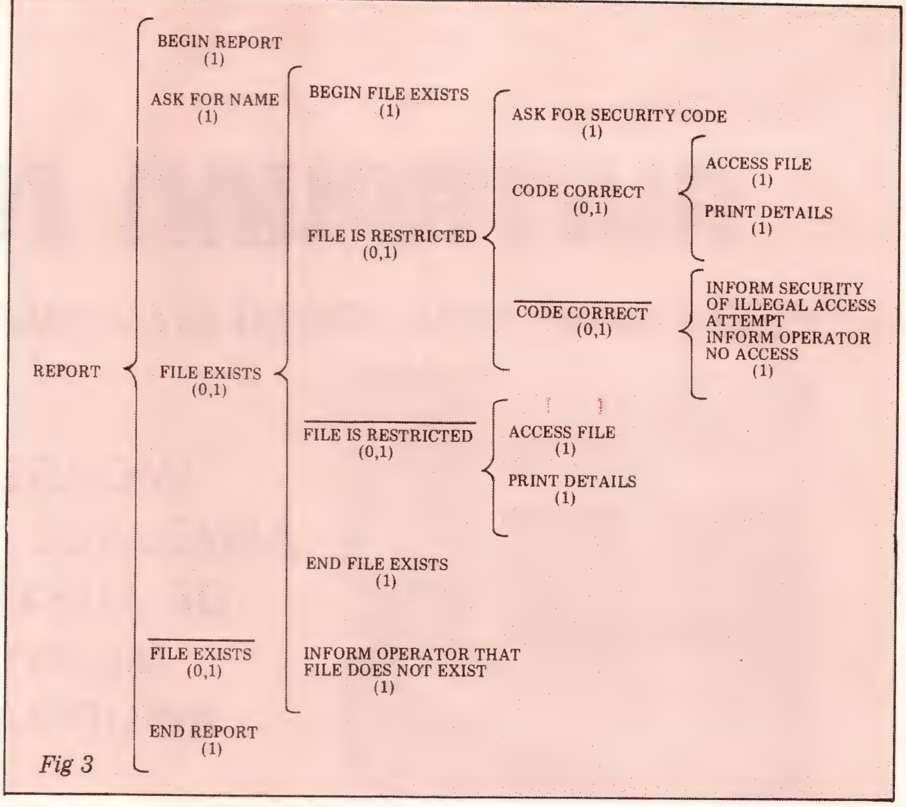
The secret in transforming the Warnier diagram into the finished program lies in treating all of the brackets containing more than one operation as subroutines. If this is done, then it's very easy to code the program by working from the largest bracket as a 'main block'. Lower-level brackets are called as subroutines and these may themselves call further subroutines. The pseudo-code in Figure 4 should give you the general idea.

This has been a somewhat brief introduction to this very important technique. If you want to experiment, then try the ideas with small programs at first, gradually increasing the complexity of the problems. I think you'll be very surprised at how quickly your programming assumes a more professional approach.

References

Warnier, J D: *Logical Construction of Programs*, 3rd edition, trans B M Flanagan, New York, Nostrand Reinhold, 1976.

Orr, K T: *Structured Systems Development*, New York, Yourdon Press, 1977.



REPORT
BEGIN REPORT (1)
ASK FOR NAME (1)
FILE EXISTS (0,1)
BEGIN FILE EXISTS (1)
FILE IS RESTRICTED (0,1)
ASK FOR SECURITY CODE (1)
CODE CORRECT (0,1)
ACCESS FILE (1)
PRINT DETAILS (1)
$\overline{\text{CODE CORRECT}}$ (0,1)
INFORM SECURITY OF ILLEGAL ACCESS ATTEMPT
INFORM OPERATOR NO ACCESS (1)
$\overline{\text{FILE IS RESTRICTED}}$ (0,1)
ACCESS FILE (1)
PRINT DETAILS (1)
END FILE EXISTS (1)
$\overline{\text{FILE EXISTS}}$ (0,1)
INFORM OPERATOR THAT FILE DOES NOT EXIST (1)
END REPORT (1)

Fig 3

```
REM     REPORT MODULE
    INPUT NAME OF FILE
    IF   FILE EXISTS THEN GOSUB "FILE EXISTS" ELSE
         PRINT "FILE DOES NOT EXIST"
    END

REM     SUBROUTINE FILE EXISTS
    IF   FILE IS RESTRICTED THEN GOSUB "RESTRICTED
         FILE" ELSE GOSUB "ACCESS"

REM     SUBROUTINE RESTRICTED FILE
    INPUT SECURITY CODE
    IF   SECURITY CODE=CORRECT CODE THEN GOSUB
         "ACCESS" ELSE GOSUB "ILLEGAL ACCESS"
    RETURN

REM     SUBROUTINE ILLEGAL ACCESS
    WRITE TO ILLEGAL ACCESS FILE THE TIME OF ACCESS
         ATTEMPT AND USER CODE
    PRINT "THIS IS A RESTRICTED FILE – YOUR ACCESS
         CODE DOES NOT PERMIT YOU ENTRY"
    RETURN

REM     SUBROUTINE ACCESS
    (This would access whatever data the file contained
         and display it on a terminal, printer, etc)
  RETURN
```

Fig 4

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HP INTERFACE

David McFarlane presents another article for HP series 80 users.

THANKYOU and PLEASE

It has been most gratifying to receive your suggestions and contributions for which we thank you. However most have been received by the backdoor so to speak – via HP dealers, HP themselves, etc. To make our job a little easier and to facilitate acknowledgement and reply please address all correspondence, queries, suggestions to: HP Interface, Australian Personal Computer, P.O. Box 115, CARLTON, 3053, Victoria.

HEWLETT-PACKARD HP125 and C/PM

As many readers are now no doubt aware, Hewlett Packard have released their entry in the C/PM Micro market. With the catch cry of "No manager should have to manage without one," it is apparent what area Hewlett Packard expect most prospective users to come from.

Keep an eye out for a bench test of this, one of the first C/PM machines by a "Heavy weight" manufacturer, in a forthcoming issue of APC.

In the meantime it has been decided that HP Interface will also address HP125 users. In this respect we have already had a number of requests for information on suitable Data Base Management Software for the HP125. Simply put, what is the best DBMS and why? Please send your advice and comments to HP Interface at the above address.

SORTING

Sorting algorithms are all difficult to follow with their multiple indices and looping within loops. The bubble sort is the exception, which is probably why everybody knows about it. Conceptually, it's delightful – the smallest element "floats" to the top. The program only requires two indices, but the processing workload is horrendous and so is the execution time. In this article, we'll look at some other sorting techniques and discuss a way of deciding which one to use. There is no one "best" algorithm; the best one to use depends on the length of the list and the distribution and order of the list elements. But you don't have to immerse yourself in binary trees and other esoteric concepts to be able to choose a good sorting algorithm. You can use a more pragmatical approach.

A while back, a letter was received that pointed out this approach. "On page 177 of the HP-85 Owner's Manual, a program is shown that sorts numbers using a method referred to as a 'bubble sort'. As a novice programmer, I used this technique for sorting. Recently, I have been introduced to a faster sort called the 'Shell-Metzner sort'. To find the speed advantage, I modified the program on page 177 to include some timing statements. I then changed the program to use the 'Shell-Metzner' technique. Sorting the integers 100 to 1 required 2.66 minutes for the 'bubble sort' and only 0.4 minutes for the 'Shell-Metzner sort'." Programs for assessing the two algorithms using the internal timer are listed below.

```
 10 OPTION BASE 1
 20 DIM A(100)
 30 DISP "HOW MANY NUMBERS";
 40 INPUT N
 60 FOR I=1 TO N
 70 A(I)=N+1-I
 80 NEXT I
 90 Z1=TIME
100 FOR K=1 TO N-1
110 FOR M=K+1 TO N
150 IF A(K)<=A(M) THEN GOTO 190
160 R=A(K) @ A(K)=A(M) @ A(M)=R
190 NEXT M
200 NEXT K
220 Z2=TIME @ Z3=(Z2-Z1)/60
230 PRINT "HERE IS THE LIST IN
   INCREASING ORDER"
240 FOR I=1 TO N
250 PRINT A(I);
260 NEXT I
270 PRINT
280 PRINT "SORTING TIME WAS";
  Z3;'MINUTES FOR BUBBLE SORT"
290 END
```

```
 10 OPTION BASE 1
 20 DIM A(100)
 30 DISP "HOW MANY NUMBERS":
 40 INPUT N
 50 FOR I=1 TO N
 60 A(I)=N+1-I
 70 NEXT I
 80 Z1=TIME
 90 M=N
100 M=INT(M/2)
110 IF M=0 THEN GOTO 210
120 FOR S=1 TO M
130 I=S @ J=S+M @ Z=0
140 IF A(I)<=A(J)
    THEN GOTO 160
150 Z=1 @ R=A(I) @ A(I)=A(J)
    @ A (J)=R
160 I=J @ J=J+M
170 IF J<N+1 THEN GOTO 140
180 IF Z=1 THEN GOTO 130
190 NEXT S
200 GOTO 100
210 Z2=TIME @ Z3=(Z2-Z1)/60
220 PRINT "HERE IS THE LIST IN
   INCREASING ORDER"
230 FOR I=1 TO N
240 PRINT A(I);
250 NEXT I
260 PRINT
270 PRINT"SORTING TIME WAS";Z3;
   "MINUTES FOR SHELL-METZNER S
   ORT"

280 END
```

The Shell-Metzner is a frequently used, very fast algorithm. Were the number of elements (N) increased, the difference would have been even more dramatic. While the number of comparisons made in the bubble sort goes up exponentially with the number of elements to be sorted, actually (N**2–N)/2 comparisons, the number of comparisons made in the Shell-Metzner sort is a linear function, about 10*N. The number of reversals required in the Shell-Metzner algorithm is also linear, about 5*N for a normal distribution of elements, or about half the time.

Note that the number of reversals actually made in the test programs above would have been quite different were the list originally reversed (change line 60 to

A (I) = N + 1 – I).

Execution time would be different still if the array A were comprised of random integers with a normal distribution.

This leads us to the next algorithm. What if the list is already pretty much in order, like a mailing list with a few new additions? A routine published in the September 1980 issue of *BYTE* runs about 7 times faster than the Shell-Metzner sort when the list is ordered to begin with. And the algorithm is just a bubble sort, with a window! "The idea is so simple it cannot be new" says the author, Paul Brady. If you have programs that require ordered data in files, you can afford to call this routine even if nothing were done to disturb the order.

```
 10 OPTION BASE 1
 20 DIM A(100)
 30 DISP "HOW MANY NUMBERS"
 40 INPUT N
 60 FOR I=1 TO N
 70 A(I)=I
 80 NEXT I
 90 Z1=TIME
100 W=2 @ X=N
110 FOR I=1 TO N
120 T1=X @ X=0
130 IF W<2 THEN W=2
140 T2=W-1 @ W=0
150 FOR J=T2 TO T1-1
160 IF A(J)<=A(J+1)THEN GOTO 20
    0
170 T=A(J) @ A(J)=A(J+1)@ A(J+1
    )=T
180 X=J
190 IF W=0 THEN W=J
200 NEXT J @ IF X<=1THEN GOTO 2
    30
220 NEXT I
230 Z2=TIME @ Z3=(Z2-Z1)/60
240 PRINT"HERE IS THE LIST IN I
    NCREASING ORDER"
250 FOR I=1 TO N
260 PRINT A(I);
270 NEXT I
280 PRINT
290 PRINT "SORTING TIME WAS";
  Z3;'MINUTES FOR WINDOW SORT"
300 END
```

There are also algorithms that are optimal when the list to be sorted is considerably disordered. For example, the September issue of *Creative Computing* contains a Basic listing and a discussion of "Heapsort" that meets this contingency. However, with this particular test (i.e., just 100 numbers), the execution times were 2.70 and 4.16 minutes for A(1)=100 and A(1)=1, respectively. The important thing is that you fit the sorting algorithm to your data, and doing this simply involves timing the candidates.

Our editors Miriam Cosic and Graeme Domm have put their heads together and come up with a brilliant idea.

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STEXT GRAPHICS

by Matthew Hurd

STEXT is a program which uses the high resolution graphics facilities on a forty eight kilobyte Apple II computer to their fullest extent. This program allows a combination of characters, circles, lines and points to be plotted on a video screen in a well presented efficient manner. This variability enables anything from simple engineering drawings to labelled diagrams and documents to be produced and saved so that they may be reproduced over and over again.

While in the character mode which allows the creation of characters on the screen of the Apple computer's video monitor, characters may be plotted that are the same size as the height of the screen or they may be the same size as the normal text characters which the Apple computer normally produces. This program can change the case of the characters from upper to lower, which under normal circumstances is not available to the operator. Any of the six colours of the high resolution graphics screen can be used although weak colours such as orange produce unwanted results due to the fact that some colours are more difficult to produce than others.

Lines can be drawn from one specified point to another and points can be plotted at any position on the Apple's high resolution graphics window. Circles may be drawn by giving the radius and the centre's coordinates.

Little or no programming knowledge is needed to operate this program. It can provide interest and a slice of computer education to the student while it can still provide some interest to the adult. The screens which this program can produce can be used as education aids in the class, as an art media or for enjoyment or for an infinite amount of uses depending on the imagination of the operator. This program can easily be adapted for a variety of purposes by changing and modifying its structure.

CHARACTER MODE

Character mode is the major mode, being the mode from which all the other modes in the program can be accessed. When a new screen appears for the first time in STEXT the program is automatically in the character mode and the cursor appears in the top lefthand corner of the screen. Most of the control characters (i.e. the key marked (ctrl) is held down while another character is being depressed. This new character obtained is said to be the control of the key being depressed.) either control the cursor's movement or enable access to be gained to other modes of the program. The cursor controls move the cursor about the screen and are divided into two parts, firstly the non destructive cursor controls which, as the name suggests, enable movement of the cursor without deleting any characters and secondly the destructive cursor controls which delete characters but do not move the cursor. The special control characters for moving the cursor are as follows:

CONTROL H	The cursor is moved back one position. This is the same as the left arrow.
CONTROL I	The cursor is moved up one line.
CONTROL J	The cursor is moved down one line.
CONTROL B	The cursor is moved to the last character position on the screen.
CONTROL T	The cursor is moved to the first character position on the screen.
CONTROL U	The cursor is moved right one position. This is the same as the right arrow and space.
CONTROL M	The cursor is moved to the beginning of the next line. This is the same as RETURN.

The special control characters for destroying characters are as follows:

CONTROL K	This deletes the current character position.
CONTROL W	The entire line is overwritten.
CONTROL D	Deletes the entire screen and returns a fresh screen.

The following control characters have various purposes and these are as follows:

CONTROL A	This allows the colour of the screen to be altered.
CONTROL C	The mode is changed to circle mode.
CONTROL E	This allows exit from the program.
CONTROL G	The mode is changed to graphics.
CONTROL L	The mode is changed to the line mode.
CONTROL N	The colour is changed.
CONTROL P	The mode is changed to point plotting.
CONTROL Q	The size of the characters is allowed to be changed.
CONTROL S	Saves the completed screen.
ESCAPE	Changes upper case to lower case and lower case to upper case.

Key board characters can be made appear on the screen by simply pressing the characters key down. Lower case lettering which is not normally available on the Apple microcomputer's screen is available on the high resolution graphics screen while in this program.

GRAPHICS MODE

In graphics mode a line can be directed around the screen using the keys 'I' for upward movement, 'M' for downward movement, 'J' for movement

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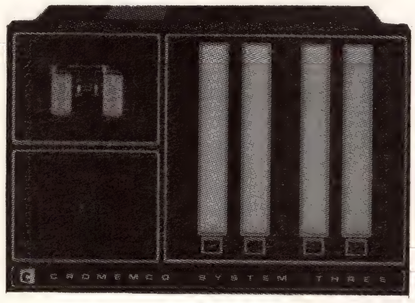

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leftwards and 'K' for movement rightwards. This mode is accessed by typing CONTROL G while in the character mode.

While in the graphics mode there are two sub-modes. These are simply

(1) plot, and
(2) move.

When access is gained to this mode you are automatically in the plot mode which allows the plotting of the end of the line as the end of the line is moved about the screen using the keys mentioned above. The move mode is obtained by pressing the key marked 'C'. While in this sub-mode movement is allowed by using the same keys as in the plot sub-mode but no position is plotted on the screen. To change the sub-mode back to the plot sub-mode the key marked @ P must be pressed. A different colour can be obtained by changing the mode to colour changing mode which is done by depressing the key marked 'N'. After the colour changing mode has successfully run through, the control is passed back to the graphics mode where continuation from the last position is allowed. The approximate whereabouts of the next character to be plotted can be maintained by moving the end of the line to the general position of the next character. Access back to the character mode is gained by activating CONTROL G again.

Care must be taken in choosing the colour of the line as not all the colours will appear on the wanted lines especially colours such as green and orange which are very weak. This problem can usually be rectified by moving the direction of the line one spot to the right or left.

The largest horizontal position available is 279 while the smallest horizontal position is 0. The largest vertical position available is 170 while the smallest vertical position is) 0.

LINE PLOTTING

Line plotting mode allows lines between points to be drawn on the Apple microcomputer's screen. Only the co-ordinates of the two points which are the ends of the line are required.

Access is gained into this mode by activating CONTROL L while in the character mode of STEXT. The screen changes to text and the following appears:

```
POSITION ONE
----------

X CO-ORDINATE -->
```

to which the horizontal position of the first point is given and then

```
Y CO-ORDINATE -->
```

appears and here the vertical position of the first point is required. After the first point's co-ordinates have been given the co-ordinate for the second point are given in the same manner. Once the two ends of the line are given COLOUR --> appears on the screen and this request is followed by the number of a colour. The numbers from zero through to seven are legal and these numbers represent the following colours:

1) green
2) purple
3) white
4) black
5) orange
6) blue
7) white
0) black

The question "Do you wish to change anything?" will be put forward once the colour of the line has been supplied. This expects and will only accept the reply 'Y' or 'N'. 'Y' for yes and 'N' for no. The horizontal position for any point must be equal or greater than zero and smaller than or equal to two hundred and seventy nine while the vertical position for any point must be greater than or equal to zero and smaller than or equal to one hundred and seventy. If the point is out of these limits an error is given and the line has to be determined again. If the answer to the question "do you wish to change anything?" is Y the co-ordinates of the point have to be completely re-entered. If the answer to this question is "no" then the line is plotted and shown and the option of plotting another line is given in the form "AGAIN?" to which either 'N' or 'Y' can be answered. If the answer is 'Y' the line plotting mode repeats itself and if the answer is 'N' the control passes back to the character mode. Supplied is an example:

```
POSITION ONE
----------

X CO-ORDINATE --> 0
Y CO-ORDINATE --> 0

POSITION TWO
----------

X CO-ORDINATE --> 279
Y CO-ORDINATE --> 170

COLOUR --> 1

DO YOU WISH TO CHANGE
   ANYTHING? N
```

At this moment the screen shall change back to full screen high resolution graphics and the line shall be plotted from one corner to the other in the colour green. To provide time for the line to be observed a number of random notes are made by the computer. The program now continues with

```
AGAIN? N
```

Now the computer switches back to high resolution graphics and back to the character mode.

POINT PLOTTING MODE

Access is gained to the point plotting mode by activating CONTROL P while in the character mode. First of all the number of points to be input are entered. Then the horizontal and vertical positions for each point are input. The horizontal position must be smaller than or equal to 279 and greater than or equal to 0. The vertical position must be smaller than or equal to 170 and larger than or equal to 0. After each ten points the option of continuing until all the points have been input is given or continuing in the character mode is allowed.

Example

```
NUMBER OF POINTS TO BE
   PLOTTED -->            (RETURN)
POSITION 1
-------

X CO-ORDINATE --> 279
   (RETURN)

POSITION 2
-------

X CO-ORDINATE -->   0 (RETURN)
Y CO-ORDINATE -->   0 (RETURN)
```

Now the screen changes to high resolution graphics and the mode is changed from point plotting mode to the character mode. Check to see if the dots are there in two of the screen's corners.

CIRCLE MODE

While in the circle mode a circle almost any radius can be plotted at any location on the screen in any available colour. CONTROL G must be activated from the character mode to access the circle mode.

When first in the circle mode the radius is inputted and then the position horizontally of the centre and then the position vertically of the centre. Next the "RESOLUTION RATING" is input. The resolution rating is the accuracy and speed at which the circle will be plotted on the screen. The resolution rating cannot be equal to or less than zero and if it is an error message will be given. The larger the resolution rating the faster it will be plotted and the further apart from the plotted points will be. 10 is a suitable resolution rating for most circles. The circle may be larger than the screen and the points not on the screen shall not be plotted. The radius of a circle cannot be larger than 325. Once the circle has been plotted the control is passed back to the character mode.

Try plotting a circle with the horizontal position 139 and a vertical position of 85 and a radius of any radius and a resolution rating of ten.

COLOUR CHANGE MODE

The colour changing mode is accessed by simply activating CONTROL N while in the character mode. This mode can also be accessed via other modes. When in the colour changing mode a colour is chosen by depressing a key numbered zero through to seven.

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After the colour has been chosen the colour indicator on the screen changes to the colour chosen and the control is passed back to the previous mode. Care must be taken while choosing colours as not all the colours are able to be created at every spot on the video terminals screen due to the Apple micro-computer.

The available colours and their numbers are as follows:

1) Green
2) Purple
3) White
4) Black
5) Orange
6) Blue
7) White
0) Black

SCREEN COLOUR MODE

The screen changing mode is accessed by activating CONTROL A while in the character mode. When the colour of screen is altered everything which was previously on the screen is deleted. To avoid the accidental deletion of a screen through this method a safety catch is supplied. If you find yourself in this mode accidentally press the key marker 'E' and you will be returned to the character mode. Otherwise the procedure is the same as in the colour changing mode with the differences that the screen is changed to the specified colour and the screen indicator is changed to the screen's colour. After the completion of this mode the control is passed back to the character mode. The available colours and their numbers are the same as in the colour changing mode.

SIZE CHANGE

The size changing mode allows the altering of the character scales. The limits on the scale are that the scale must not be less than one or greater than seventeen. Scales larger than two may bring unwanted results. While in the larger scales access can still be gained to the smaller scales as long as the scale is between the limits set out above.

An example.

The screen is switched to text and the text screen is cleared. The scale appears.

```
SCALE  1:1
SCALE  -->   2 (RETURN)
```

The screen is switched back to the previous high resolution graphics screen and continuation is allowed.

SCREEN SAVING

The screen saving mode allows the saving of a screen. The screen name must begin with a letter and the length of the name must not exceed thirty characters. If these requirements are not met the name will have to be given again after an error message has been given. After the screen has been saved a fresh screen appears.

An example.

```
SCREEN NAME  -->   260 (RETURN)
%ILLEGAL SCREEN NAME
SCREEN  NAME   -->      EXAMPLE
    RETURN
```

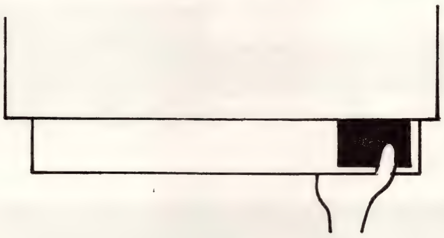
The disk drive now whirs into action and the continuation of a fresh screen is allowed when the screen changes back to high resolution graphics.

SECTION TO COME

AN EXAMPLE

AN EXAMPLE

Insert the floppy diskette into the disk drive and close its flap while the Apple micro-computer is switched off.



Insert the diskette this way

Turn on the Apple's power supply and also its video monitor. Wait for the message "DISK READY BOOTED WITH DOS 3.2" to appear on the screen and then the prompt (which will usually be square closed parenthesis e.g.]) and then type what is in red type and the computer shall respond with what is in the black type. A "#" will be used to represent the square closed parenthesis.

```
DISK  READY  BOOTED  WITH  DOS
    3.2
#RUN CONTROL
DISK CONTROL
----------
1.              DRAW
2.              RESEQ
3.              STEXT
    REQUEST -->    3
DO  YOU  REQUIRE  HELP:  (Y)ES
(N)O  -->      N  (use  Y  if  required)*
```

(* this help option has been deleted)

At this point the disk drive shall whir into action and the file containing the shapes of all the characters will be loaded into the computer's memory or core memory from the diskette. This is from where all the character's shapes are stored so they can be reproduced in an instant once loaded into core memory. The main memory of the computer is named core memory because tiny magnetic cores were and still are used for the computer's memory but these have now been largely replaced by integrated circuits or silicon chips which are much more compact. These shapes are kept on the disk for long term storage. After the character's shapes have been loaded into memory the computer switches from text to high resolution graphics. Then a line appears on the top of the screen called the cursor. Below the cursor is a colour indicator which shows what the present colour is. This should be white. You are now in the character mode.

TO CHANGE THE COLOUR:

Press the button marked ctrl and while pressing this down also press down the button marked N . The cursor should have disappeared if everything was done properly. Now press the key marked "6" and the colour indicator should change to blue and you have been returned to the character mode and the cursor should once again appear in the top left hand corner of the screen. Press any character and this will appear on the screen and the cursor will move along to the next character position and the computer shall be ready to accept the next character. Press the back arrow key and the cursor shall move back one position but it shall not delete the character. The character is deleted by activating CONTROL K just as CONTROL N was activated to change the mode to enable the colour to be changed. Type in at the key board THIS PROGRAM OUTPUTS CHARACTERS TYPED IN AT THE KEY BOARD. This sentence will be divided up into several lines. After this sentence press the RETURN key and the cursor will return to the beginning of the next line. Change the colour back to white. If you cannot remember how refer back to how the colour was changed to blue and substitute the "6" for a "3". Now press the key marked ESC and then type

WHETHER THEY BE IN UPPER OR LOWER CASE.

Press the ESC key again type in any sentence and observe the result.

TO USE KEY CONTROLLED GRAPHICS, DO:

Activate CONTROL G from the character mode which you should be in. To select a colour press down the key marked "N" and then press down any key numbered from zero through to seven. The colour indicator shall inform you on the colour you have selected. If the colour indicator completely disappears you have selected zero or four when choosing the colour as both of these denote the colour black. Once the colour has been chosen press one of the "I", "J", "K" or "M" keys and note what happens. If nothing happens then you are using a colour which the computer can only weakly produce on the video screen and you are using a route where the colour cannot be produced. This problem can be remedied by moving the end of the line to one spot either side of its present path or by choosing a stronger colour such as white. Access can be regained to the character mode by simply activating

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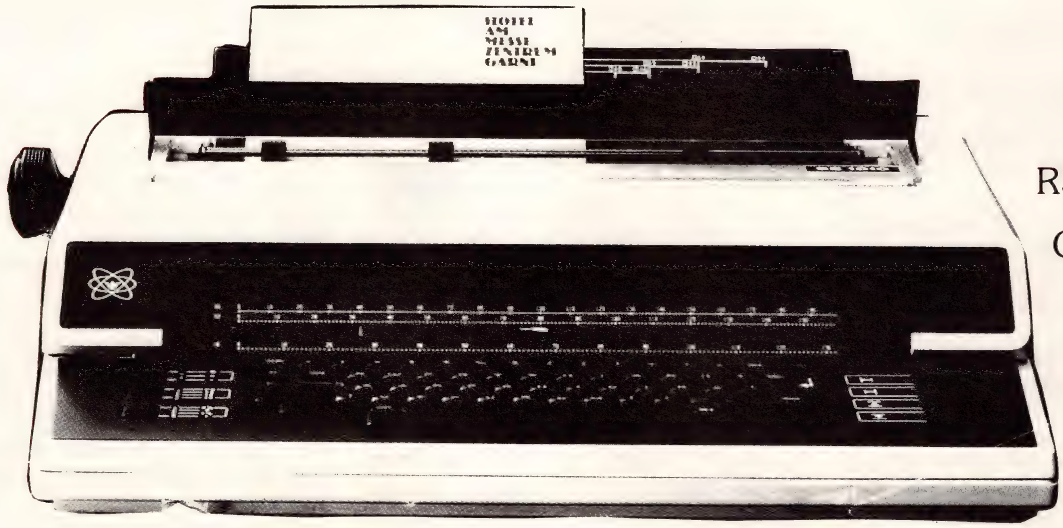

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CONTROL G once again.

After following and understanding the contents of this example you should be able to produce and effect screen by combining both characters and graphics. You can extend your knowledge of this program by reading the documentation and/or by experimenting yourself and observing the results of your own experiments. Only one more thing shall be discussed in this example and that will be how to save a screen, how to reproduce the screen once saved and how to transfer the screen from disk to disk without harm.

TO SAVE THE SCREEN:

First of all get into character mode. Now activate CONTROL S which will return the screen to text and the words "SCREEN NAME → " will appear. Enter the name of your screen and press RETURN. e.g.

```
SCREEN NAME → EXAMPLE
(RETURN)
```

The program now returns to a fresh screen and back into character mode. Exit from this program can be obtained anytime while in the character mode by activating CONTROL E. The Apple micro-computer is now out of run mode and into edit mode, which means you are out of a program and you now control the computer yourself and can do whatever you like. You can do whatever you like but the computer does not work this way; everything you tell the computer to do must be written in a special form. When using the Apple this form of language is called Basic which stands for Beginners All-purpose Symbolic Instruction Code. You can tell the computer to

```
#CLEAR THE SCREEN COMPLETELY PLEASE (RETURN)
```

But this is not written in the code form that the computer can understand and accept. Now try

```
#HOME (RETURN)
```

The SYNTAX ERROR message does not appear this time because the instruction is written in a form that the computer can understand, accept and do. The screen shall completely be cleared.

TO MAKE THE SCREEN RE-APPEAR, DO:

First of all type "CATALOG" and press RETURN and when you locate the name of your screen check that it has a "B" next to it on the left hand column. If your screen cannot be found you have made an error somewhere along the line. Type in the following:

```
#HGR2:BLOAD SNAME, A$4000
(RETURN)*
```

(* This should be

```
#HGR2 (RETURN)
```

The screen now changes to blank, now type in carefully

```
#BLOAD SNAME,A$4000 (RETURN))
```

Where SNAME is the name of the screen. The screen should reappear. To transfer the screen from disk to disk type the following:

```
BLOAD SNAME,A$4000 (RETURN)
```

Insert the diskette to which the screen is going to be transferred to and continue with:

```
#BSAVE SNAME,A$4000,L8192
(RETURN)
```

Type in #CATALOG (RETURN) and inspect the list to make sure the file has been transferred.

While the screen is on the disk where it was created by STEXT the screen may be viewed by running the display program and following the directions. Once you have successfully completed this example you may try reading the documentary on this program and explore new fields and take these in your stride.

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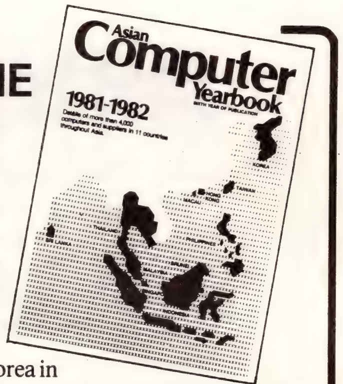

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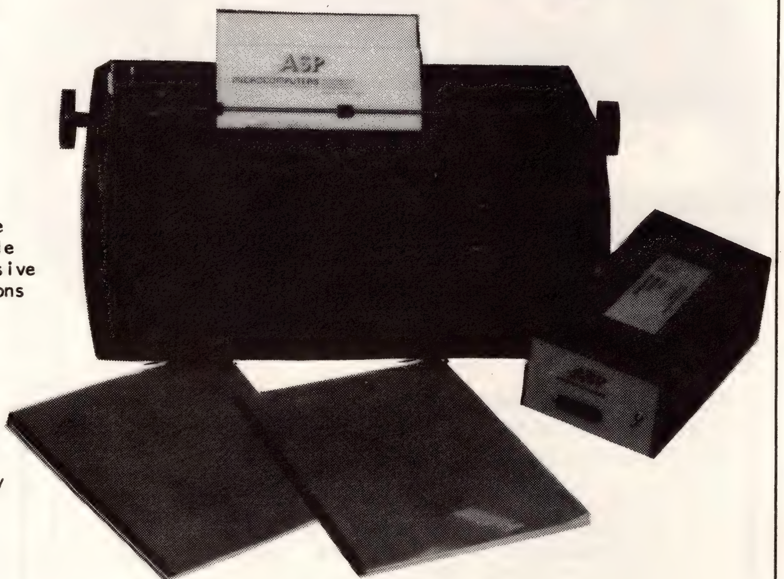

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Applecations

by Ian Webster.

The Apple II is six years old this year and moving into its maturity. It has become the standard for personal computers and despite the release of many new machines, has gone from strength to strength. None of the new machines has adopted the basic philosophy that has made the Apple a success: a RAM base with flexible and appropriate hardware design with easy user access to the system and the dissemination of technical information to the user and development communities.

Several plug compatible motherboards, usually called PEAR/PEACH or ORANGE, are now available. These boards use the Apple design and peripherals with a few added features such as U/L case and a bigger keyboard. The price differential is not great and their success depends on a question of saving money or having a real Apple with the technical support and proven design. These boards have been successful in England and Europe where price is a big consideration. They are very useful if you need an Apple that has to be rehoused because of environmental or other considerations. It is a cheap way of getting an Apple that can be extensively modified for specialised applications.

There has been tremendous dealer activity at Electronic Concepts in the last three months. There are now 80 dealers round Australia ready to support your Apple related needs. There will be a big Apple dealers convention at the end of January, so watch for a lot of co-ordinated publicity about Apples early this year.

The only new product release recently has been the Family Pak, a global promotion by APPLE Inc., that packages a complete system with disk drive and a selection of software. The Family Pak is discounted on the normal price so it may be a good deal if you are looking for a complete system with some standard software.

APPLE bought 35,000 copies of PFS for the Family Pak which gives some indication of the depth of the market for both hardware and software. Just in what a top Apple program is worth, Personal Software have just paid over one million dollars for the source code rights to the Visiplot/Visitrend package that they have been marketing. Current estimate of Apple's in Australia is around 8,000 although this does not include the Delta Apples, so the number is probably closer to 9,000.

The Apple III will be relaunched in Australia this month. APPLE have also finally released the Profile hard disk system and Pascal III for the Apple III. The system is now getting the market response and reputation this innovative machine deserves in the US. Anyone using their Apple as a work station should consider this environment, which is a magnitude more sophisticated than the Apple II, and appropriate for users who want performance and user friendliness from their machine.

On the completion of a year's contribution to this magazine, the staff of APC would like to thank Ian for his consistently authoritative and informative column.

Broderbund and IUS have visited Australia recently to assess the market for their software products. Most of the games that they get for distribution come from lone programmers all over the world and are not produced by a small group of programmers. Most programmers appear capable of producing one or two good games, Nasir being the exception. Broderbund also said that they considered most of their games copy proof as they use variable protection schemes where the parameters are varied over a large number of disks. The technique to break one copy will not necessarily work on another copy of the program.

Harry Harper from Zofarry has just returned from the USA where he demonstrated his 80 column card to an enthusiastic A.P.P.L.E. group meeting and saw his cards coming off the VISTA production line. A new ROM upgrade and manual are available for $40.00 from Zofarry. The communication code has been substantially modified to make the communications compatible with most mainframe protocols. Any sequence of Ctrl characters can be sent or received and buffer handling has been improved. The card is regarded as the best 80 col card available for the Apple and is a tribute to the persistent development efforts of Ken and Harry at Zofarry and the attention they paid to users' comments about the card.

Harry said that most of the new products released at Comdec were storage devices with several virtual disk units based on 54k RAM chips, hard disk units and tape spoolers on display.

Softalk magazine has become a major arbitrator of software sales in the US with the TOP 30 being used by Apple dealers as THE indicator of potential sales. Softalk will be available this year in Australia, possibly through Imagineering.

The availability of most of the mainstream of Apple software from Imagineering, together with El Con's improved performance has contributed to the rapid growth and maturity of the Apple market in Australia.

Beneath Apple DOS has become a standard Apple reference and a best seller in Australia. Users inspired to start commenting their own disassembly of DOS can get a labelled source text file of DOS and APPLESOFT from the Apple Dump. A compilation of the IAC Apnotes, including the Pascal Bios booklet, has also been published by the A/Dump Box 3143, GPO Sydney 2001.

Teachers interested in the possibilities of script based teaching programs should investigate the Pilot language. Apple Pilot is an outstanding but expensive Pascal implementation of the Common Pilot, the language standard. An easier introduction to the potential of this language has been developed by Bruce Keepes at Hartley

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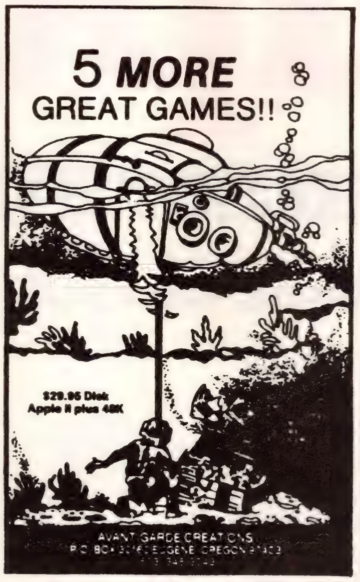

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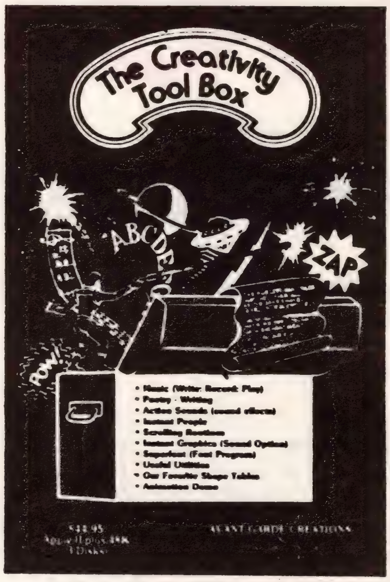

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CAE in South Australia. Co-Pilot is based on the starkweather implementation of the language and is written in Applesoft. The manual and disk are available for non-profit use at $10 (good value!)

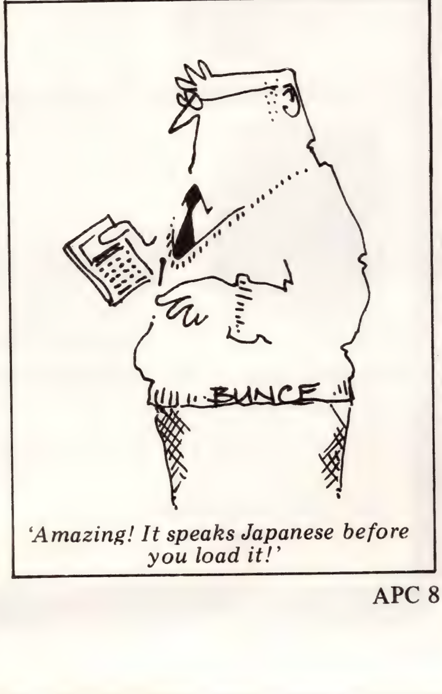
Users may come across the mysterious zero page location $D5. According to the Apple reference manual this location is not used by DOS or Applesoft, although occasionally in articles about the Apple system, the location is tagged as the Applesoft protect flag. The effect of this location can be experienced by entering a short program, then POKE 214,128 and type anything on the keyboard.

Once this flag is set to negative ASCII (> 127) then any command except for direct mode DOS commands will start execution of the program. If you have an autostart ROM the user is locked into the program.

When a line is entered DOS parses the line. All direct mode commands will be executed with the exception of SAVE, which tests the $D6 flag and exits with the message 'PROGRAM TOO LARGE' if the flag is set. If the input line is not a DOS command, it is passed to Applesoft (just before the Applesoft input parser is a test of the $D6 flag). If it is set, then the current program will execute no matter what has been entered in the input line.

It is not clear whether this feature is part of the system or whether it is an old idea that has not been developed further. The feature is used occasionally in programs and provides the basis for some of the 'Can you into break into this' programs.

Ramcard users are beginning to realise that there is a lot of empty space that can be used once Integer has been loaded into the Ramcard. The INTBASIC file on a DOS3.3 master disk contains an image of the Programmers Aid ROM at $D000-$D7FF, empty space to $DFFF, Integer Basic with Sweet-16 and the mini-assembler from $E000-$F7FF and the autostart ROM from $F800-$FFFF. The autostart ROM can be replaced with an image of the old ROM if you spend a lot of time in the monitor. The easiest way to manipulate the file is to BLOAD INTBASIC then BLOAD any code you want included in the file, on top of the file, then BSAVE INTBASIC A$1000, L$3000. The code will then be loaded into the appropriate place when INTBASIC is loaded into the Ramcard.



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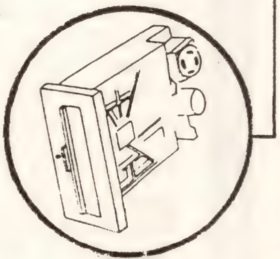

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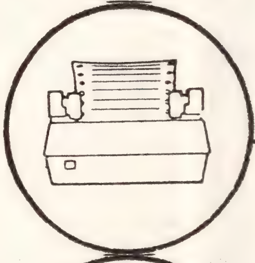

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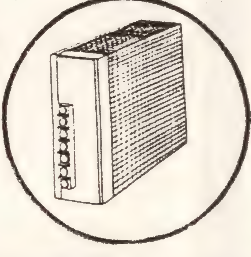

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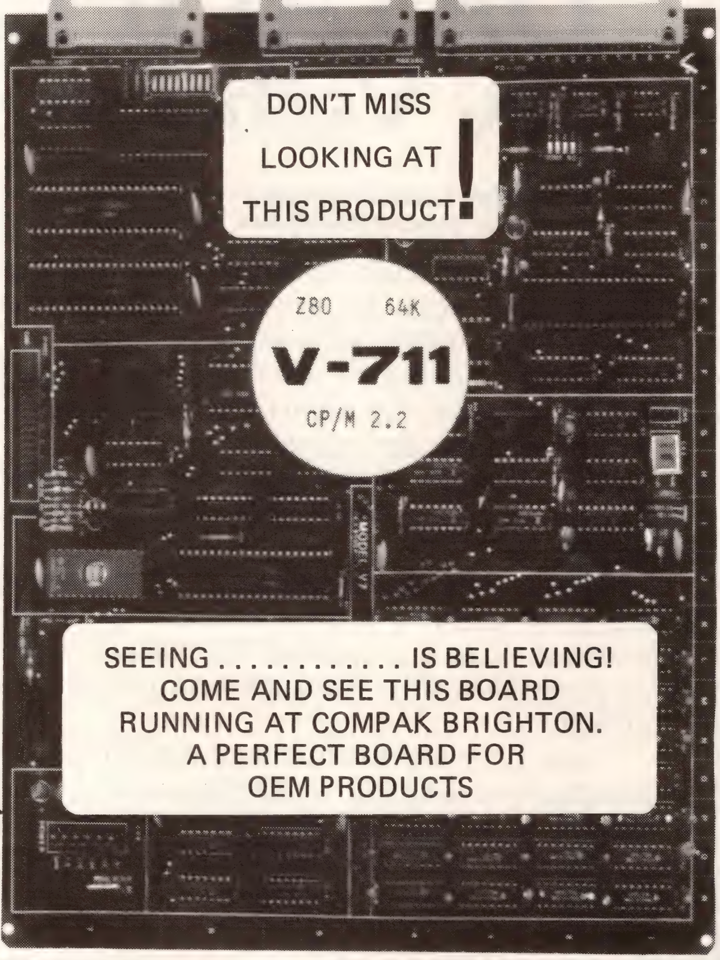

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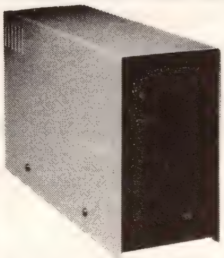

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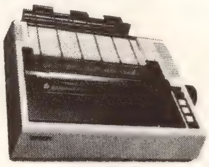

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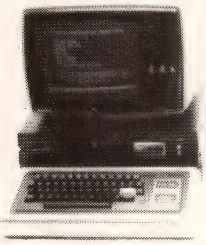

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A short cut to shape tables

by Jim Boatwood

When I bought my Apple I began the short wade through the Applesoft manual. When I finally got to Chapter 9 I experimented with shape tables for a while, then decided that it wasn't worth the sheer tediousness of the method described there, and went on to other things. A number of readers will have seen shape tables embedded in programs. I finally did too, and decided to document decimal values and the MOVES/PLOTS that they generate. I did this because I had not seen the idea described anywhere. The result is the table shown below.

All you have to do with this method is 1. Draw your shape. 2. 'Unwrap it' (If you wish to make it clearer), and 3. Convert the MOVES/PLOTS, in groups of two or three, directly into decimal equivalents and enter them via the keyboard. There are no conversions to binary and hexadecimal involved.

The abbreviations used in the table are <M>OVE, <P>LOT, <U>P, <D>OWN, <R>IGHT and <L>EFT. Your Apple will carry out each action from left to right; an entry of 23 for instance, will result in a plot left, then a move down. The lower section of the table consists of moves that you are not likely to use. (Who would want to move right, move left, then move right!)

I will use the shape shown in Chapter 9 of the Applesoft manual as an exercise in using this method. The object is to draw the 'square without corners' that is on page 93.

Because a shape table set up in this manner resides in your program, instead of being loaded in, two parameters have to be included in your code as well. They are 1. The start address of the shape table and 2. The value of himem.

Start Address: POKE 232,252:POKE 233,29 is the equivalent of E8:FC 1D as shown in the manual. Himem = 7676 is the equivalent of 73:FC 1D, although it would be advisable to set himem to one byte below the start address of the shape table, I.E. at 7675. The rest goes like so:

```
DATA   1,0,4,0,18,63,32,100,45,21,54,
  30,7,0
FOR A = 7676 TO 7689:READ B:
  POKE A,B:NEXT: . . . . .
DRAW 1 AT AEXPR1,AEXPR2 . . .
  ETC.
```

Build a program around that loading and you will have a square without corners!

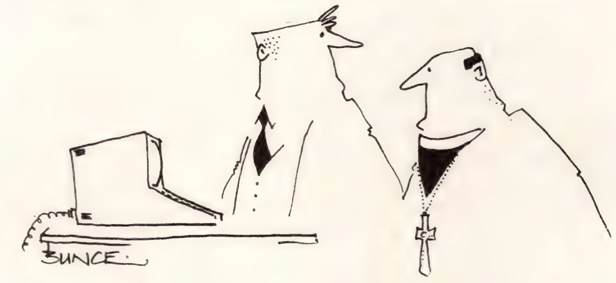
The rules mentioned in the last paragraph on page 92 of the manual still apply, of course, with this method, however, you cannot accidentally terminate a shape definition, because none of the right hand or 'last done' moves is a move up (translated to all zeroes). Finally, you will notice that the MOVES/PLOTS have a sequence. Any one vertical column reads MU, MR, MD, ML, PU, PR, PD, PL in that order, occurring in longer sequences in the middle and left columns. The recurring sequence makes it easy to find a particular combination of moves, once you are used to it.

May your tables really shape up to something!

VALUE	MOVE	VALUE	MOVE	VALUE	MOVE	VALUE	MOVE	VALUE	MOVE
01	MR	44	PU, PR	137	MR, MR, MD	219	ML, PL, ML	70	PD, MU, MR
02	MD	60	PU, PL	81	MR, MD, MR	68	PU, MU, MR	166	PD, MU, ML
03	ML	13	PR, MR	145	MR, MD, MD	164	PU, MU, ML	78	PD, MR, MR
04	PU	21	PR, MD	97	MR, PU, MR	76	PU, MR, MR	142	PD, MR, MD
05	PR	29	PR, ML	193	MR, PU, ML	140	PU, MR, MD	86	PD, MD, MR
06	PD	37	PR, PU	105	MR, PR, MR	84	PU, MD, MR	150	PD, MD, MD
07	PL	45	PR, PR	201	MR, PR, ML	148	PU, MD, MD	182	PD, MD, ML
08	MU, MR	53	PR, PD	113	MR, PD, MR	180	PU, MD, ML	158	PD, ML, MD
24	MU, ML	14	PD, MR	209	MR, PD, ML	156	PU, ML, MD	190	PD, ML, ML
32	MU, PU	22	PD, MD	74	MD, MR, MR	188	PU, ML, ML	102	PD, PU, MR
40	MU, PR	30	PD, ML	138	MD, MR, MD	100	PU, PU, MR	198	PD, PU, ML
56	MU, PL	38	PD, PU	82	MD, MD, MR	196	PU, PU, ML	110	PD, PR, MR
09	MR, MR	46	PD, PR	146	MD, MD, MD	108	PU, PR, MR	206	PD, PR, ML
17	MR, MD	54	PD, PD	178	MD, MD, ML	204	PU, PR, ML	118	PD, PD, MR
33	MR, PU	62	PD, PL	154	MD, ML, MD	116	PU, PD, MR	214	PD, PD, ML
41	MR, PR	15	PL, MR	186	MD, ML, ML	212	PU, PD, ML	126	PD, PL, MR
49	MR, PD	23	PL, MD	98	MD, PU, MR	124	PU, PL, MR	222	PD, PL, ML
10	MD, MR	31	PL, ML	194	MR, PU, ML	220	PU, PL, ML	71	PL, MU, MR
18	MD, MD	39	PL, PU	106	MD, PR, MR	69	PR, MU, MR	167	PL, MU, ML
26	MD, ML	55	PL, PD	202	MD, PR, ML	165	PR, MU, ML	79	PL, MR, MR
34	MD, PU	63	PL, PL	114	MD, PD, MR	77	PR, MR, MR	143	PL, MR, MD
42	MD, PR	64	MU, MU, MR	210	MD, PD, ML	141	PR, MR, MD	87	PL, MD, MR
50	MD, PD	160	MU, MU, ML	122	MD, PL, MR	85	PR, MD, MR	151	PL, MD, MD
58	MD, PL	72	MU, MR, MR	218	MD, PL, ML	149	PR, MD, MD	183	PL, MD, ML
19	ML, MD	184	MU, ML, ML	163	ML, MU, ML	181	PR, MD, ML	159	PL, ML, MD
27	ML, ML	96	MU, PU, MR	147	ML, MD, MD	157	PR, ML, MD	191	PL, ML, ML
35	ML, PU	192	MU, PU, ML	179	ML, MD, ML	189	PR, ML, ML	103	PL, PU, MR

```
 43    ML,PR I 104  MU,PR,MR I 155  ML,ML,MD I 101  PR,PU,MR I 199  PL,PU,ML
 51    ML,PD I 200  MU,PR,ML I 187  ML,ML,ML I 197  PR,PU,ML I 111  PL,PR,MR
 59    ML,PL I 208  MU,PD,ML I  99  ML,PU,MR I 109  PR,PR,MR I 207  PL,PR,ML
 12    PU,MR I 120  MU,PL,MR I 195  ML,PU,ML I 205  PR,PR,ML I 119  PL,PD,MR
 20    PU,MD I 216  MU,PL,ML I 115  ML,PD,MR I 117  PR,PD,MR I 215  PL,PD,ML
 28    PU,ML I  65  MR,MU,MR I 211  ML,PD,ML I 213  PR,PD,ML I 127  PL,PL,MR
 36    PU,PU I  73  MR,MR,MR I 123  ML,PL,MR I 221  PR,PL,ML I 223  PL,PL,ML
------------------------------------------------------------------------------
 16    MU,MD I  80  MU,MD,MR I 185  MR,ML,ML I  75  ML,MR,MR I 173  PR,MR,ML
 48    MU,PD I 144  MU,MD,MD I 153  MR,ML,MD I 139  ML,MR,MD I  93  PR,ML,MR
 25    MR,ML I 176  MU,MD,ML I 121  MR,PL,MR I 171  ML,MR,ML I 125  PR,PL,MR
 57    MR,PL I  88  MU,ML,MR I 217  MR,PL,ML I  83  ML,MD,MR I 134  PD,MU,MD
 11    ML,MR I 152  MU,ML,MD I  66  MD,MU,MR I  91  ML,ML,MR I 174  PD,MR,ML
 52    PU,PD I 112  MU,PD,MR I 130  MD,MU,MD I 107  ML,PR,MR I  94  PD,ML,MR
 61    PR,PL I 129  MR,MU,MD I 162  MD,MU,ML I 203  ML,PR,ML I 135  PL,MU,MD
 47    PL,PR I 161  MR,MU,ML I 170  MD,MR,ML I 132  PU,MU,MD I 175  PL,MR,ML
128 MU,MU,MD I 169  MR,MR,ML I  90  MD,ML,ML I 172  PU,MR,ML I  95  PL,ML,MR
136 MU,MR,MD I 177  MR,MD,ML I  67  ML,MU,MR I  92  PU,ML,MR
168 MU,MR,ML I  89  MR,ML,MR I 131  ML,MU,MD I 133  PR,MU,MD
```

'Aren't you taking this Master of the Keyboard thing a bit far, sir?'



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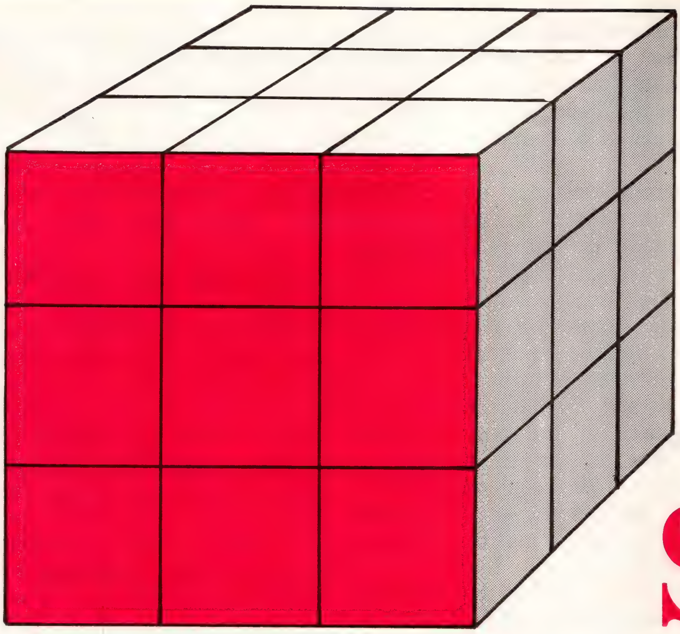
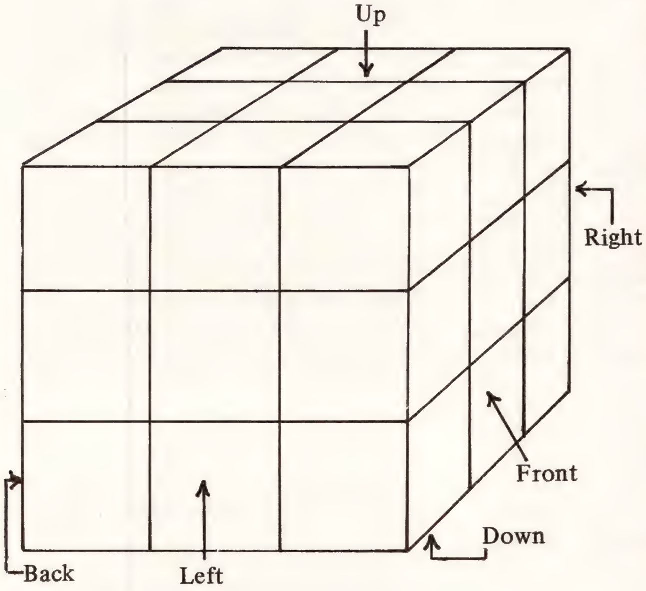


Rubik's Cube Simulation

by Jonathan Schultz

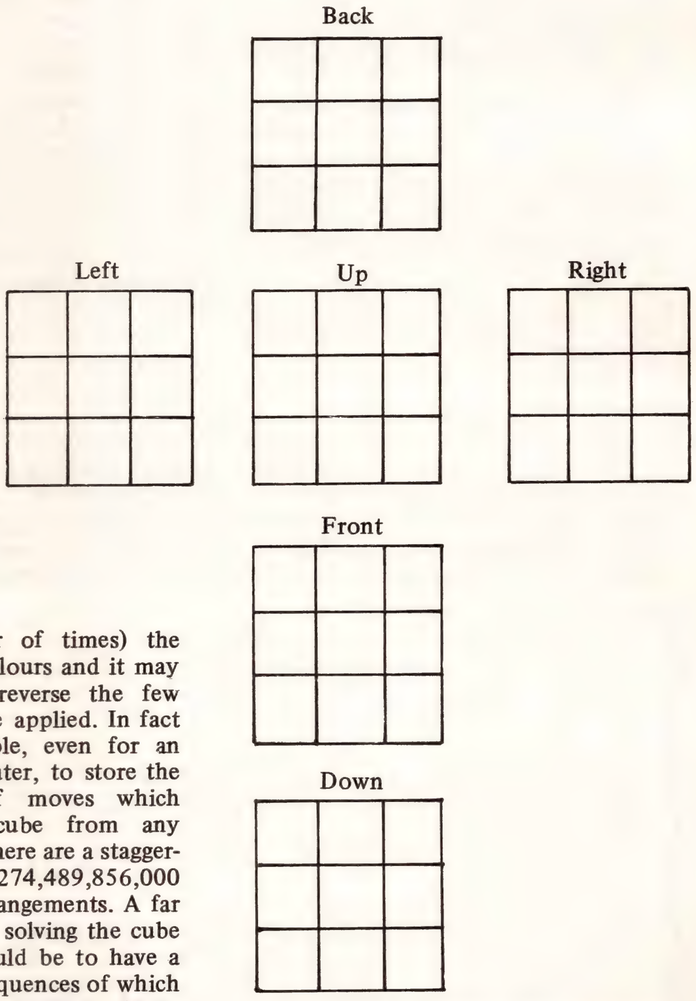
This article describes a simulation program of the popular Rubik's Cube, otherwise known as Wonderful Puzzler and Hungarian Cube. It is written for the Apple, but should not require much modification to run under any form of Basic.



The faces on the cube

WHAT IS THE RUBIK'S CUBE

The Rubik's cube is a 3 by 3 by 3 cube any of the faces of which can be rotated. Of course rotating any of the faces also has interesting effects on the rest of the cube. When you buy the cube each of the faces has stickers of a different color on it. It does not take much playing before the cube is an utter jumble of colors. The problem is to restore it to the starting position. This is not at all as simple as it may first seem. Even after only two or three moves have been applied (a move being defined as the turning of a face in any direction any number of times) the cube is a jumble of colours and it may seem impossible to reverse the few moves which you have applied. In fact it would be impossible, even for an extremely large computer, to store the shortest sequence of moves which would restore the cube from any given condition since there are a staggeringly large 43,252,003,274,489,856,000 number of possible arrangements. A far more practical way of solving the cube from any position would be to have a few relatively simple sequences of which the effects are known which could be applied to the cube at the appropriate time in order to solve it.



The faces on the screen

THE NEED FOR A SIMPLE NOTATION

Obviously, if we are to have a simple set of sequences, we must be able to clearly define them. All a sequence is though, is a set of moves applied one after the other, without changing the orientation of the whole cube. So if we can define a move, we can define a sequence. To define a move, we need to know two things:

1. The face which is being turned.
2. The direction and number of times it is being moved.

The way we define the face which is being turned is to give each face a name. If you hold the cube in front of you, the face pointing towards you, we name the front face, the one facing away from you, the back face, the two faces looking sideways, the left and right face, the uppermost face, the up face and the lower face, the down face. In practice, we just use the first letter when naming a face: i.e. F, B, L, R, U and D.

It is obvious that the only valid number of twists are 1, 2 and 3 clockwise or anti-clockwise since everything is modulo 4: i.e. turning a face 4 times in either direction is the same as not turning it at all. The way this program represents these moves is 1, 2 or 3 moves clockwise (anti-clockwise is not allowed). For example, the description of the move which turns the face to your right 90 degrees anti-clockwise would be R3.

The last thing required in order to define sequences is a way of entering a whole sequence of moves in one go. This program requires that you separate the moves with a slash. For example, a simple sequence of moves might be: R/F/R3/F3.

WHY WRITE A COMPUTER SIMULATION?

If you wish to observe the effect of sequences of moves, it is often annoying to find that you have made a mistake and you once again have to consult a book or find someone to solve the cube. On the other hand, with a computer simulation, you can safely try out sequences without risking your cube's finished state. Also if you have succeeded in messing up your cube, you may be able to figure out how to solve it yourself with the aid of a computer program.

Writing the program was not as simple as deciding it needed to be written, though. I decided to represent the cube as a 9 by 6 matrix. Deciding which element in the matrix would represent which little square on the cube required that I looked at what exactly happens when a face is turned.

When a face is turned 90 degrees clockwise every square on the face except the centre one moves to a corresponding position 90 degrees clockwise. To make this simple, consecutive elements in the matrix represent squares going around the outside of the face. Each face is represented by matrix elements like this, except with different rotation factors:

1 2 3
8 9 4
7 6 5

The other squares moved when a face is turned are those which are adjacent to the face which is being rotated. These are moved as three cycles of four. Some simple patterns could be seen in these groups but the pattern was different for the turning of each different face. My original cube simulation program, written in FORTRAN, has a different subroutine for turning each face, with one common one, which cycled the squares actually on the face being rotated, since it was always the same operation which had to be done. Also, the subroutine which showed the user what the current configuration of the cube was, as it would appear on a real cube, was extremely long, since there are virtually no patterns which can be followed.

Though this program was fine on a Dec-System 10, it was obviously not going to be efficient on a microcomputer, with relatively little memory. I decided to cut down on memory usage by having one subroutine which would cycle the squares adjacent to any face. The only way to do this would be to have the positions of the squares to be cycled stored in DATA statements. Since the computer represents faces as 1..6 instead of R,L,etc. and it takes 24 elements of data to define the movements for one move, all the program needs to do to find the data that it is looking for is to skip (N-1) *24 elements of data, where N is the number representing the face to be twisted.

The program may also obtain the data necessary for outputting the current position of the cube from DATA statements. This data will enable the program to output the position of the cube however it wants. My program gets the colour it wants each number to represent from an array. Then it simply plots a point in that colour. Though the program is written in APPLESOFT, the only parts that need be altered to enable it to run on any colour computer are the actual plotting statements. If your computer does not have colour, but does have special graphics characters, such as PET, these could be used. Otherwise, characters from the standard set could be used.

USING THE PROGRAM

When you run the program, it shows you the current position of the cube, the finished state, and requests you to "ENTER COMMAND". You may now type any of the commands previously described plus "I", which resets the cube and "Q", which exits the program. The position of the cube is constantly maintained on the screen, you do not have to tell it to do this. There is one thing which should be said about the projection of the bottom face on the screen. It is viewed as though you are looking from beneath the cube.

When you have the program running, you might like to try out some of these sequences and observe the effects:

a) R2/L2/U2/D2/F2/B2
b) B/F3/R/L3/U/D3/B/F3
c) F/B/R/L/F/B/R/L/F/B/R/L/U2/D2
d) F/B/U/D/R3/L3/F/B
e) F/B/R/L/F/B/R/L/F/B/R/L

```
1   REM  RUBIK'S CUBE SIMULATION
2   REM  BY JONATHAN SCHULTZ
3   REM  PERTH, WA
10  GR
20 C$(1) = "B":C$(2) = "F":C$(3) = "R":C$(4) = "L":C$(5) = "D":C$(6) = "U"
30 CD(1) = 6:CD(2) = 15:CD(3) = 12:CD(4) = 13:CD(5) = 1:CD(6) = 9
40  DIM I(9,6)
50  FOR A = 1 TO 9: FOR B = 1 TO 6:I(A,B) = B: NEXT : NEXT
60  GOTO 700
100  REM  SUBROUTINE FOR TURNING A FACE
110 ITEMP = I(8,N):JTEMP = I(7,N)
120  FOR INC = 6 TO 1 STEP  - 1:I(INC + 2,N) = I(INC,N): NEXT
130 I(2,N) = ITEMP:I(1,N) = JTEMP
140  RETURN
```

```
200  REM  SUBROUTINE FOR CHANGING AN EDGE
210  FOR REP = 1 TO GO
220  RESTORE
230  IF COM > 1 THEN  FOR DUM = 1 TO (COM - 1) * 24: READ SKIP: NEXT
240  FOR I2NC = 1 TO 3
250  READ PO,FA:ITEMP = I(PO,FA)
260  FOR INC = 1 TO 3
270  READ P2,F2:I(PO,FA) = I(P2,F2)
280 PO = P2:FA = F2
290  NEXT
300 I(P2,F2) = ITEMP
310  NEXT
320 N = COM: GOSUB 100
330  NEXT
340  RETURN
400  REM  SUBROUTNE FOR PRINTING CUBE
410  RESTORE
420  FOR DUM = 1 TO 144: READ SKIP: NEXT
430  FOR Y = 0 TO 4 STEP 2
440  FOR X = 7 TO 11 STEP 2
450  READ PO,FA: COLOR= CD(I(PO,FA)): PLOT X + 10,Y
460  NEXT
470  NEXT
480  FOR Y = 7 TO 11 STEP 2
490  FOR A = 0 TO 2
500  FOR X = A * 7 TO A * 7 + 4 STEP 2
510  READ PO,FA: COLOR= CD(I(PO,FA)): PLOT X + 10,Y
520  NEXT
530  NEXT
540  NEXT
550  FOR A = 0 TO 1.5 STEP 1.5
560  FOR Y =  INT (A * 7 + 14) TO  INT (A * 7 + 18) STEP 2
570  FOR X = 7 TO 11 STEP 2
580  READ PO,FA: COLOR= CD(I(PO,FA)): PLOT X + 10,Y
590  NEXT
600  NEXT
610  NEXT
620  RETURN
700  HOME : VTAB (22)
710  GOSUB 400
720  INPUT "ENTER COMMAND-->";CH$
730 BB = 0
740 AA = 0
750 AA = AA + 1: IF  MID$ (CH$,BB + AA,1) <  > "/" AND AA <  LEN (CH$) THEN 750
760 CM$ =  MID$ (CH$,BB + 1,AA):BB = BB + AA
770  IF  LEFT$ (CM$,1) = "Q" THEN  TEXT : HOME : END
780  IF  LEFT$ (CM$,1) <  > "I" THEN 820
790  FOR A = 1 TO 9: FOR B = 1 TO 6:I(A,B) = B: NEXT : NEXT : GOSUB 400
800  IF AA <  LEN (CH$) THEN 740
810  GOTO 720
820 G = 0:A = 0
830 A = A + 1: IF  MID$ (CM$,1,1) = C$(A) THEN G = 1
840  IF G = 0 AND A < 6 THEN 830
850  IF G = 1 THEN COM = A: GOTO 870
860  PRINT "ERROR!": GOTO 720
870  IF  LEN (CM$) = 1 THEN 900
880 CM$ =  MID$ (CM$,2,1)
890  IF CM$ >  = "1" AND CM$ <  = "9" THEN GO =  ASC (CM$) - 48:GO = GO -
     INT (GO / 4) * 4: GOTO 905
900 GO = 1
905  IF GO = 0 THEN 930
910  GOSUB 200
```

```
920  GOSUB 400
930  IF BB <  LEN (CH$) THEN 740
940  GOTO 720
1000  REM  DATA FOR MOVES
1010  DATA  3,4,5,6,7,3,5,5,4,4,6,6,8,3,6,5,5,4,7,6,1,3,7,5
1020  DATA  7,4,1,5,3,3,1,6,8,4,2,5,4,3,2,6,1,4,3,5,5,3,3,6
1030  DATA  7,2,3,5,3,1,7,6,8,2,4,5,4,1,8,6,1,2,5,5,5,1,1,6
1040  DATA  7,1,7,5,3,2,3,6,8,1,8,5,4,2,4,6,1,1,1,5,5,2,5,6
1050  DATA  1,3,1,2,1,4,1,1,2,3,2,2,2,4,2,1,3,3,3,2,3,4,3,1
1060  DATA  5,3,5,1,5,4,5,2,6,3,6,1,6,4,6,2,7,3,7,1,7,4,7,2
1100  REM  DATA FOR PRINTING
1110  DATA  1,1,2,1,3,1,8,1,9,1,4,1,7,1,6,1,5,1
1120  DATA  3,4,4,4,5,4,5,6,6,6,7,6,7,3,8,3,1,3
1130  DATA  2,4,9,4,6,4,4,6,9,6,8,6,6,3,9,3,2,3
1140  DATA  1,4,8,4,7,4,3,6,2,6,1,6,5,3,4,3,3,3
1150  DATA  5,2,6,2,7,2,4,2,9,2,8,2,3,2,2,2,1,2
1160  DATA 1,5,2,5,3,5,8,5,9,5,4,5,7,5,6,5,5,5
```

"No sir, it's called a 'home computer' because it costs the same as a triple-fronted brick veneer".

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SHARP IQ3100 MICROTRANSLATOR

John Fairbairn tests the latest in pocket translators.

As a professional linguist, I am usually assumed to pour scorn on phrase-books or their silicon-chip equivalents. But I, and especially my stomach, have frightful memories of a stay in Hungary, the one country I have been to where I did not have at least a smattering of the language, The only word I knew was for ice-cream — and that is the only thing I was given that was edible. I soon acquired an image of Hungary as a surly and depressing place, and I couldn't wait to get over the border to Czechoslovakia and "civilisation".

I have no doubt now that I am being unfair to a beautiful country, but to me civilisation is based on communication and anything that helps that along is a blessing. For example, the Sharp IQ3100 Microtranslator.

After testing this new machine for a month round the tourist haunts, I am happy to say it's fun and it works and it's the best around. At about $169 plus $32 for each language module it's not exactly cheap, unless you can set it against tax, but it's certainly a novel way to chat up the opposite sex.

First impressions of the IQ3100 were highly favourable: sleek, robust, and genuinely pocket-sized. Those feelings soon changed to abject terror after I read the first five pages of the otherwise satisfactory instruction book. To paraphrase them: unless you handle the tiny language modules with the skill of a brain surgeon, that's $32 up the spout. I managed to get two modules, the maximum, into the machine safely but put that down to the clove of garlic in my back pocket. But once the modules were in, the machine confirmed its robust impression, even when rammed into a shoulder bag on a crowded tube train.

In use

Then it was idiot's test time: press every button in sight and see what happens. The machine responded at once — but not in the obvious way. To get the thing to translate anything you have to read the instruction book; which means you can't accost a stranger, tap out a question for him, and then pass the machine to him for a reply — a serious design fault with no obvious solution.

Other design niggles were the alphabetically ordered keyboard (though, of course, it has to be that way for other countries), the wrist strap which surely should be at the top right corner, and the display, which is the liquid crystal type seen in the Sharp PC-1211 pocket computer (24 characters, 7x5 dot matrix, all upper case). This display is attractive, especially when it rotates to show long sentences (using the DSP key). However, at certain angles it looks blank and if you point the machine at someone in the street in bright sunlight you are apt (I speak from experience) to get some very funny looks.

Another difficulty with the display is that letter 'O' and number '0' are not differentiated (they are only slightly so on the keyboard). But the box of tricks inside *does* differentiate, and if you ask for a DOCTOR with zeroes instead of vowels you might be dead before you realise why it won't translate.

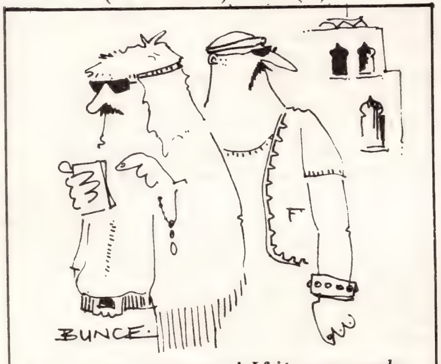
Once the machine is powered up (using the non-rechargeable one-year battery provided), you choose the languages to work in. English is built in and you can add one or two of the eight other languages so far available: Dutch, French, German, Italian, Japanese (in romanised or kana forms), Portuguese, Spanish or Swedish. The modules are easy to change — provided you take care!

You press the LNG key repeatedly until arrows point to the two languages you want (little stickers are provided for two vacant slots after SPA for the rare languages), then press the double-arrow key to alternate the arrows on the display pointing 'from' and 'to' a language.

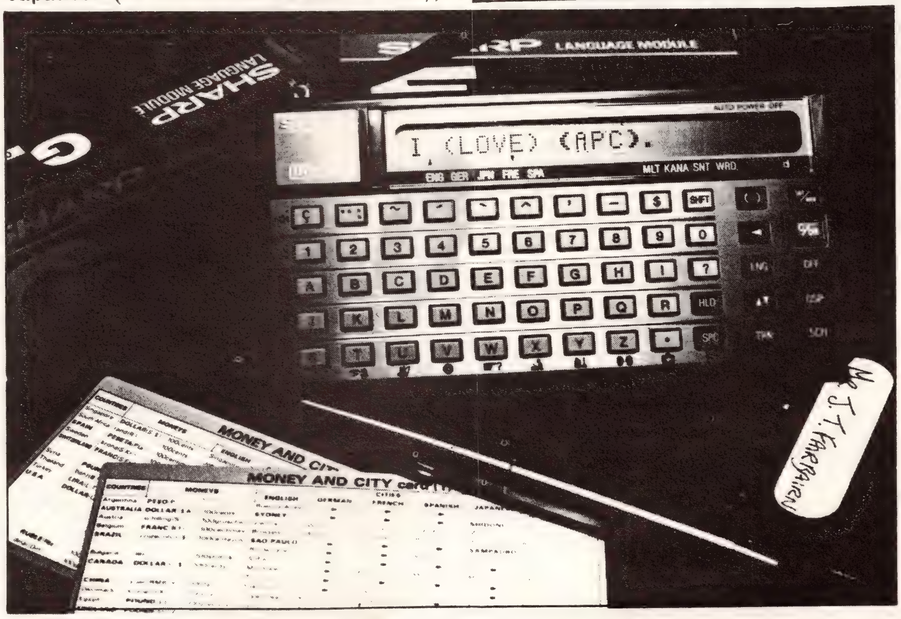
You then have a choice of typing in a word or sequence of words and translating that (pressing TRN), or of pressing the SNT/WRD key to set the machine to a category mode. In that mode you can choose sentences or words (by one or two presses of SNT/WRD). The category most appropriate, one of 14 clearly labelled round the outside (plane, Customs, transport, hotel, restaurant, sightseeing, amusement, shopping, direction, business, service, conversation, doctor, emergency) is chosen by pressing the key next to the symbol. For example, using sentences, pressing S (restaurant) brings the display DO YOU HAVE A (BAR)?

You can accept this sentence or search through all the sentences in that category (11 in this case) by pressing SCH. Stepping through SCH in this category gives next:

I DO NOT HAVE A RESERVATION
I WANT (A TABLE) FOR (7)



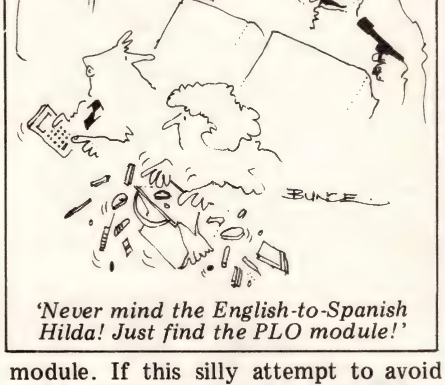
'Aw, come on, man! If it can speak Moroccan, how come it can't sell us any dope?'



The IQ3100

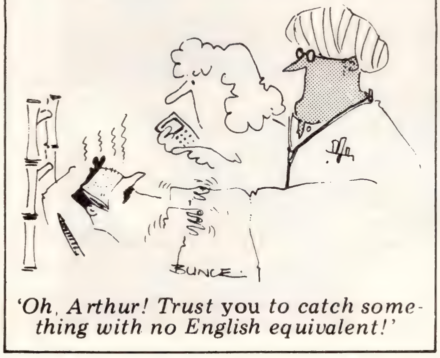
WHAT DO YOU RECOMMEND?
PLEASE GIVE ME (A GIN FIZZ)

You can change any word in brackets (if there are two sets of brackets, use the key () to alternate between them) simply by typing in the new word, as the first key-stroke wipes out what was in brackets and the replacement letters are displayed inside them. This business can be made to work smoothly, but consider first one of the worst cases: you want a book. You find the gin-fizz phrase, which takes about 25 seconds after switching on, then type in A BOOK (at least 10 seconds), press TRN, wait for five seconds and, hey presto, you get DONNEZ-MOI (UN(UNE) LIVRE(LIRE)) S.V.P. from the French module. If this silly attempt to avoid saying 'give me a pound' instead of 'give me a book' could be justified on the grounds of avoiding arrest for vagrancy in Paris, good enough; but I think the excessive preoccupation with the problem of multiple meanings or genders betrays the conceit of the linguists behind the modules. The problem is there and has to be met, particularly because it is the commonest words that tend to have multiple meanings, but it seems reasonable to allow a fair measure of ambiguity, even more so when I tell you that you can't use plurals or other noun declensions or decline verbs or change tenses — in short, you get a pretty peculiar output, anyway. But it still works — so why worry about one more peculiarity?

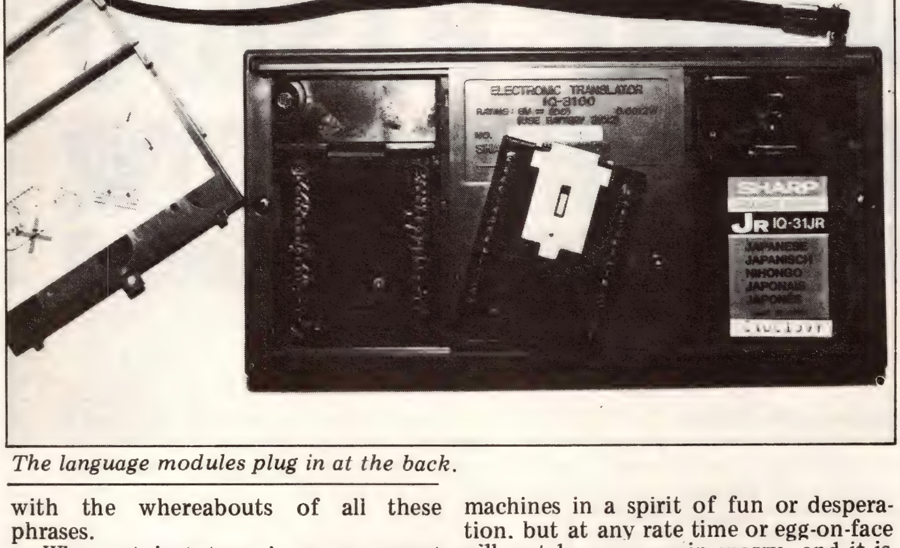


'Never mind the English-to-Spanish Hilda! Just find the PLO module!'

If you made a mistake and didn't want to ask for a book, but had already typed that, it would take you about 30 seconds to step round back to the gin-fizz phrase. I'm sure you realise by this time that you have to be pretty familiar with the whereabouts of all these phrases.



'Oh, Arthur! Trust you to catch something with no English equivalent!'



The language modules plug in at the back.

Why not just type in your request straight off, without going through the category mode? Answer: input GIVE ME A NEWSPAPER gives output DONNER ME UN(UNE) NEWSPAPER. This is because it will translate literally word for word or set-phrase for set-phrase only, with no attempt to change word order or to make any other grammatical concessions. And if you try a word that's not in the 2000 or so words of the memory that word is left untranslated, usually with the addition of '!!' and always in the case of rude words.

The box of tricks is, therefore, little more than a program for retrieving data from a file. Some idea of how this works can be inferred from another feature, the dictionary search. Type in an initial letter or letters and by pressing SCH you can step through all the words in the memory that begin that way. Until these machines become as familiar in use as calculators are, almost the only way to find out what a foreigner is saying is to try to pick out the first letter of the most important word (the one he keeps repeating or shouting), type that in, then point the machine at him while you step through the dictionary, hoping what he's saying is in there.

'Oooh, Manuel! The things you tap out!'

I said earlier that all this can work quite smoothly, but you probably don't believe me. The point is, you use these machines in a spirit of fun or desperation. but at any rate time or egg-on-face will not be your main worry, and it is amazing how much you can murder a language and still be understood. You do become familiar with the machine, and learn what kinds of sentences or words it will find digestible (a sort of basic English). The selection of words in the memory bank is excellent, apart from a few words like gin-fizz and Americanisms.

Above all, don't forget that the IQ3100 can be used as a back-up when you already know a little of the language. It is an invaluable dictionary (and very fast when used exclusively that way), with the 2000 words being far in excess of the 800-odd words that were used successfully to render Chambers *Dictionary of Science* into basic English, and not too much below the *specialist* dictionaries of around 3000 words used in many mainframe machine-translation projects.

Conclusion

Sharp's IQ3100 is by no means the first pocket electronic phrase-book, nor are its features novel, but in my opinion it is streets ahead of the opposition, both in design and price.

Finally, should you wait until machines that are cheaper/actually translate/play Space Invaders come along before you buy? I used to work on machine translation myself and now, as part of my normal job, I follow the Japanese technical press, including personal computer magazines. Nothing I have gleaned leads me to believe there will be any drastic new developments in the near future — but as a linguist who's had to translate phrases like 'of the' at least a billion times, I'd love to be proved wrong.

The only work on translation using personal computers that I know of was a French-English/English-French Dictionary program in Basic that appeared in *Byte* January 1980, pp. 206-208. The IQ3100 is available from major retail outlets and calculator specialists..

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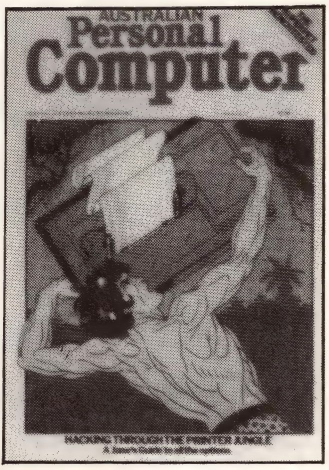

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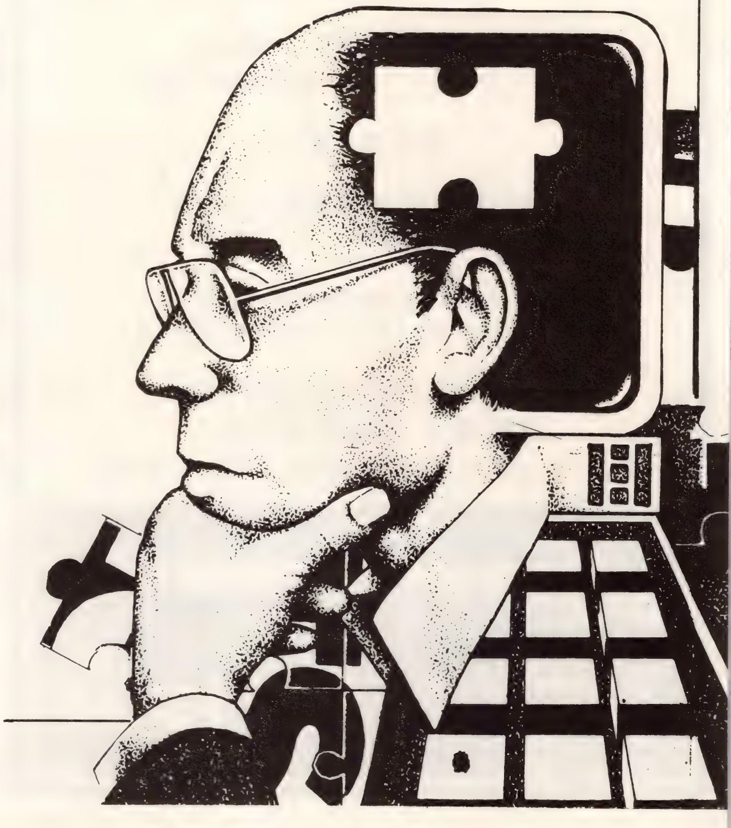

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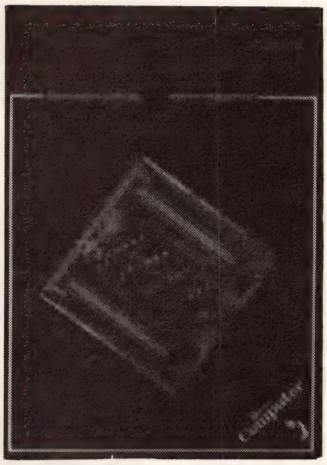

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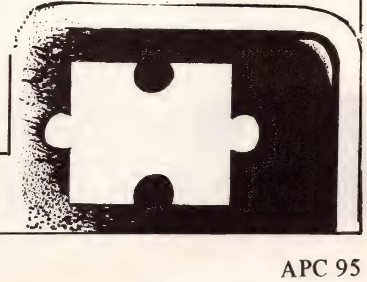

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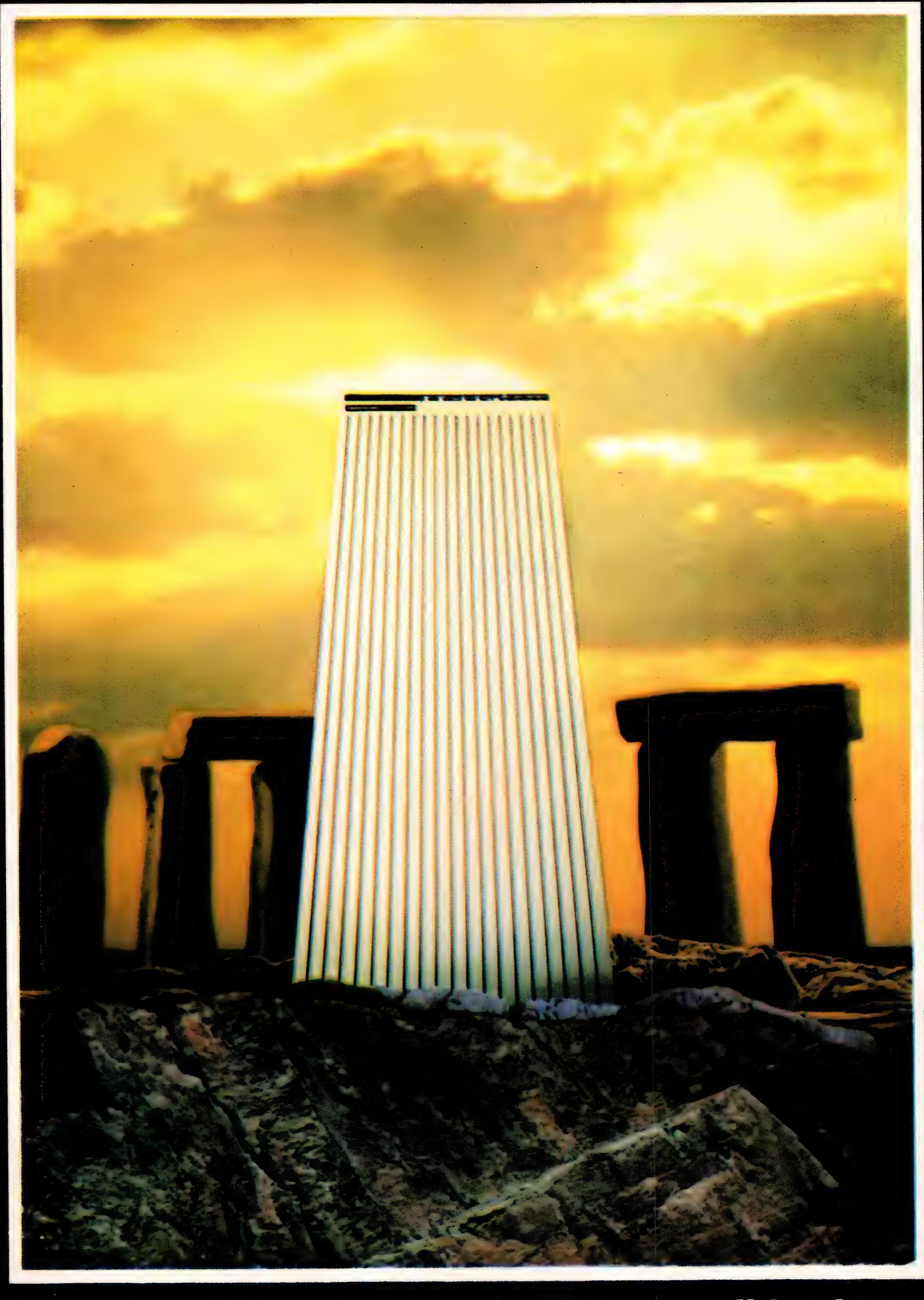
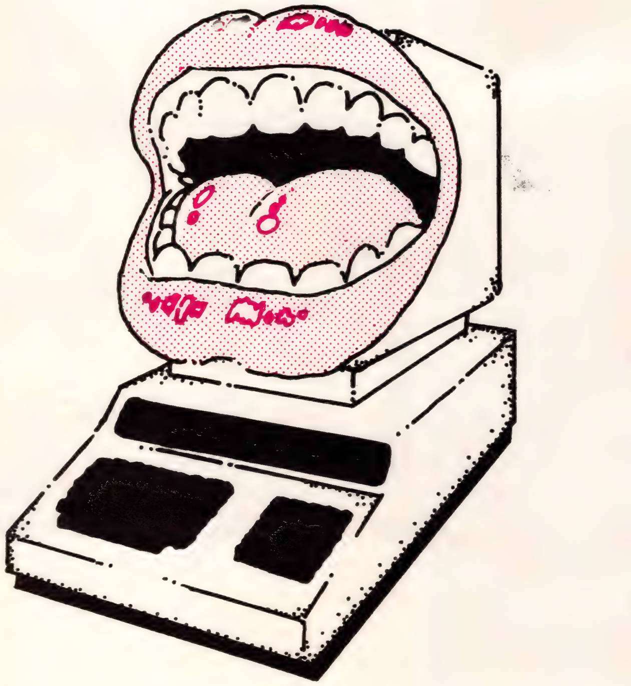


Computers: Dawn of a new era for small business

MAN MACHINE AND MOUTH



by Louis Belcourt

We have all seen or heard of movies where robots or computers communicate with Homo Sapiens using artificial voice. Can fiction be turned into reality?

As far back as history can record, man has created, invented and searched for innovations due to his intelligence. Only 30 years ago, the first digital computer (ENIAC) was completed. It used 18000 vacuum tubes, weighed more than 30 tons and performed only 5000 operations per second. Today with the use of the integrated circuit (IC) the very large-scale circuit computers require only a fraction of the power and size of ENIAC.

The electronic revolution is well on its way and computers are already part of our lives. Whether we are at work, watching television at home, depositing money in a bank or catching a plane, there is a computer working for us. However technology and progress do not stop there. Computers are filtering deeper into our lives and have finally reached our "foyer". There are thousands of these computers already established in our homes (shall we say they are part of the family?). Whenever the home computers, microprocessors or personal computers can budget our daily expenses or advise us of what to eat, or just entertain us through games, there is now a new "baby" added to the family. This is the speech processor chip or voice synthesizer chip.

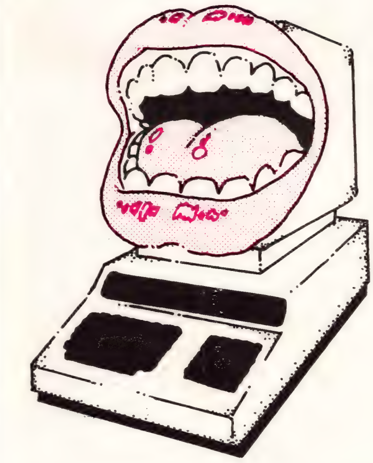
Reproduction of the human voice through mechanical or electronic means has been around for quite some time, through the telephone, gramophone, radio and so on. It is not surprising that technology has progressed towards adding voice to the already well established home computer. Waking up to the voice of your micro reminding you not only of the time but that today is your anniversary and "if you have no gift for your wife/husband stay asleep" is now quite possible. You can even answer to such an electronic masterpiece to acknowledge her majesty's command (Eh! I mean the home computer command). But one thing to keep in mind is that computers are not worthy of the term "intelligence" (not yet anyway). They may be fast, reliable and able to talk; but they are quite stupid machines if not mastered by one of the species of this world known as the Programmer to perform specific tasks. In this fast-paced technological society, programming machines is quite simple and within the reach of any human being with a little bit of IQ. (Well . .)

Many techniques now exist for speech processing or digitization and there is already ample documentation about them. As an introduction I will only describe two techniques with which I have been experimenting in the past two months. The phoneme synthesis which is essentially electrical analog models of the human voice in the form of basic units of sound and the waveform digitization method of speech synthesis in which electrical signals representing the voice are stored and later reproduced as words.

Various chips are now available on the market at a price one can afford and they can be easily adapted to a home computer or as a unit standing on its own. One of them is the Votrax™ SC-01 speech synthesizer chip which uses the phoneme synthesis method. The SC-01 is a CMOS (complementary metal-oxide semiconductor) integrated chip that generates the basic sound units of the English language to make up words. A phoneme generator produces these basic sounds according to a numeric code fed to the SC-01 which then interprets the code and produces the corresponding phoneme sound which can be amplified, filtered and reproduced through a speaker (e.g. the decimal code 23 produces the sound "OO" which could be used in the word "book".) To generate the word "THINK" the following codes are used: 57,11,9,20,25 which represents the phoneme TH,I1,I3,NG,K. There are about 62 phenome codes stored in the SC-01 and by sending the appropriate codes sequentially any English word can be generated.

At first it appears fairly easy to generate words using the SC-01 but I discovered that it requires a considerable amount of trial and error to get the chip to produce intelligible speech. This is because the standard alphabetic characters may have more than one sound associated with a single symbol and it is often desirable to lengthen or shorten a vowel or consonant sound at the end of a syllable, word, phrase or sentence (e.g. to generate the word "TECHNICAL" I first tried "T,E,K, N,11,K,A,L" (Codes 42,44,25,13,11,25, 6,24) but found out that "T,EH1,EH3 K,N,I3,K,UH3,L" sounds much better). The "EH1" and "EH3" are two codes used to produce the sound "EH" and the number following the symbol indicates the durational relationship to the base vowel; namely the suffix 1 indicating the longest duration and the suffix 3 the shortest duration.

A much easier way to generate words or sentences is to use a speech processor chip from National Semiconductor Corp., released in a kit form under the trade name of Digitalker. This speech synthesis system consists of several N-channel MOS integrated circuits (ref fig 1) and when used with external filter, amplifier and speaker, produces high quality intelligible speech. The Digitalker Kit (DT1050) consists of the speech processor chip and two 64k ROMs which contain the compressed speech data as well as the frequency and amplitude data necessary for speech



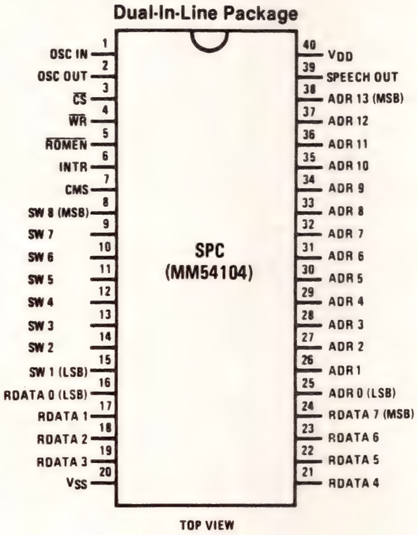
output. The two ROMs contain 144 expressions of which 137 are separate and useful English words. There are also two tones (400Hz & 80Hz) and 5 different silence durations ranging from 20ms to 320ms. One of the advantages of this SPC is that it has been designed to be easily interfaced to a microprocessor and is TTL (Transistor Transistor Logic) compatible. By simply sending a code to the processor chip the corresponding English word can be generated, e.g. the decimal code 120 generates the word "please"; the code 127 generates the word "ready". There is no complicated machine language driver or special phoneme sounds used to generate a word. Sentences can be constructed by sending codes to the SPC sequentially and subsequently by adding silence durations between the words, the quality of any sentence can be significantly improved.

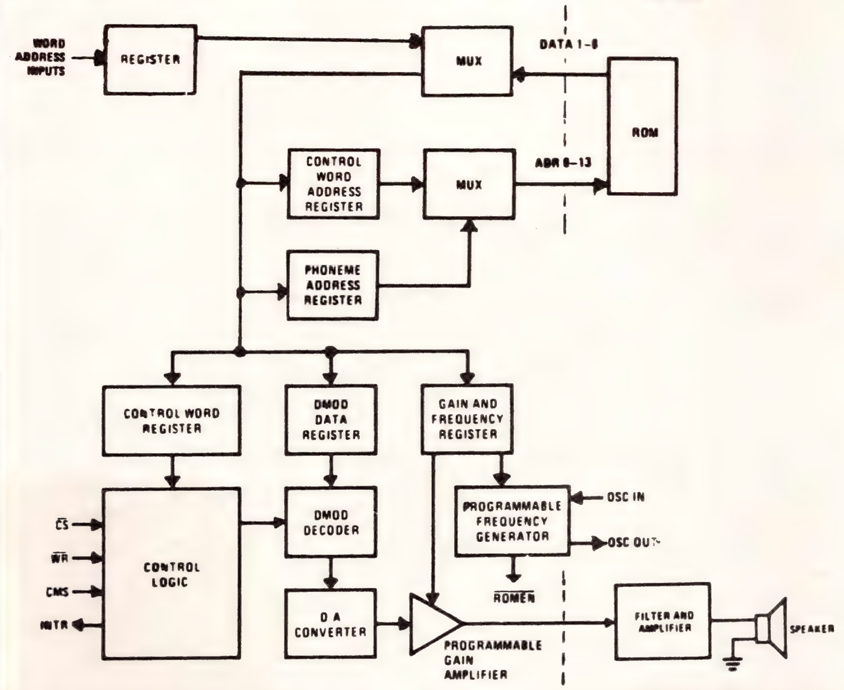
My only disappointment was that using 137 words, I could not have my micro telling jokes (just trying to impress my friends). Fortunately I found out that there are more ROMs being produced which will add more words to the Digitalker vocabulary and this could make it a project well worth while. All the codes required to produce a sentence or a story could easily be stored sequentially on cassettes or diskettes and later retrieved to produce an intelligent dialogue.

I think both the two chips described above have potential. Using the SC-01 is very educational and is certainly a lot of fun. Some of the phonemes can even be grouped together to form words from other languages. Having my micro talking French was for me quite an achievement. On the other hand, the Digitalker is so easy to use that one can concentrate on building sentences and stories directly rather than starting first to build words from phonemes. As all the words are already stored in very compact 24 Pin ROMs, the Digitalker kit can easily be assembled as a unit standing on its own.

Next month I will describe a circuit to fully interface the TRS80, System 80 and any S100 bus micro to the Digitalker using a port oriented system. More about these kits can be obtained from Microvoice, 52 Orchard St, Glen Waverley, VIC. (03) 233 6280.

SPC Block and Connection Diagrams





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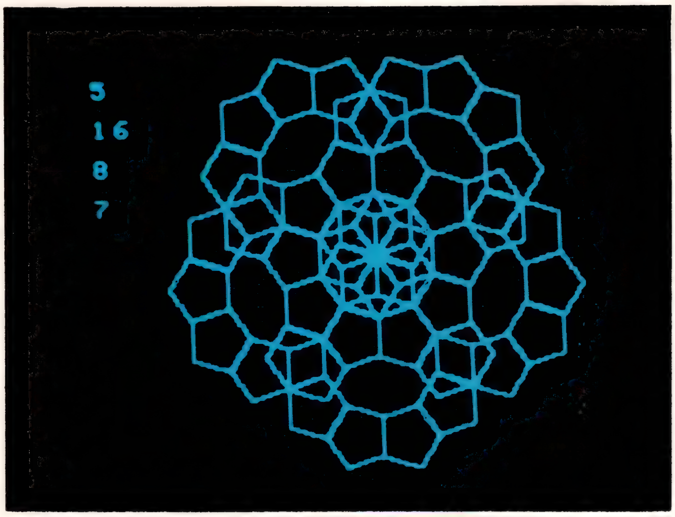

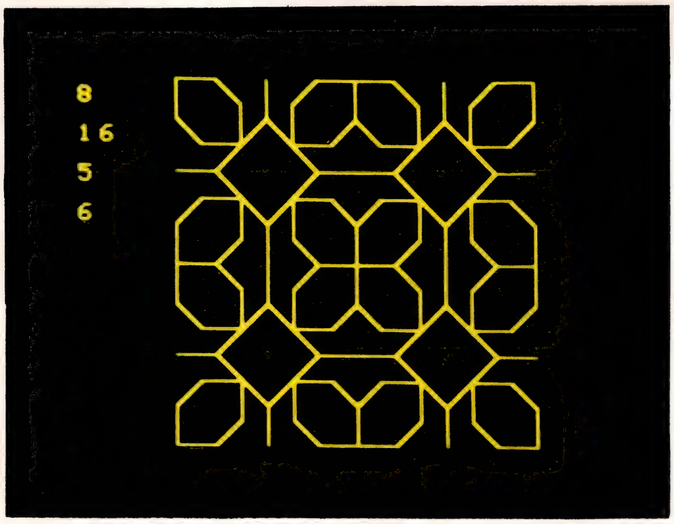

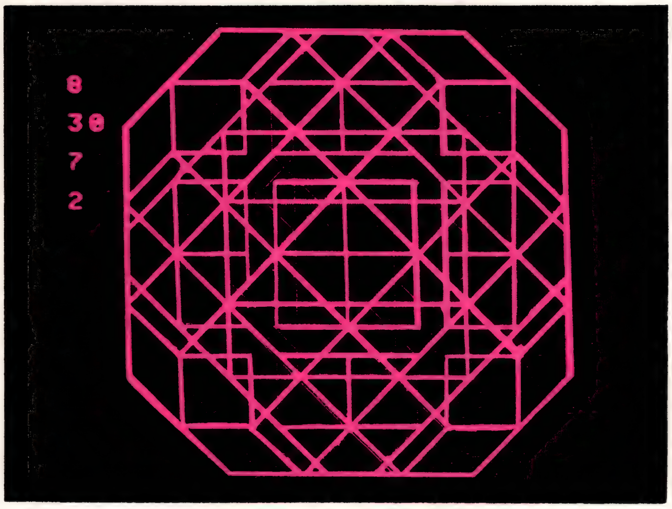

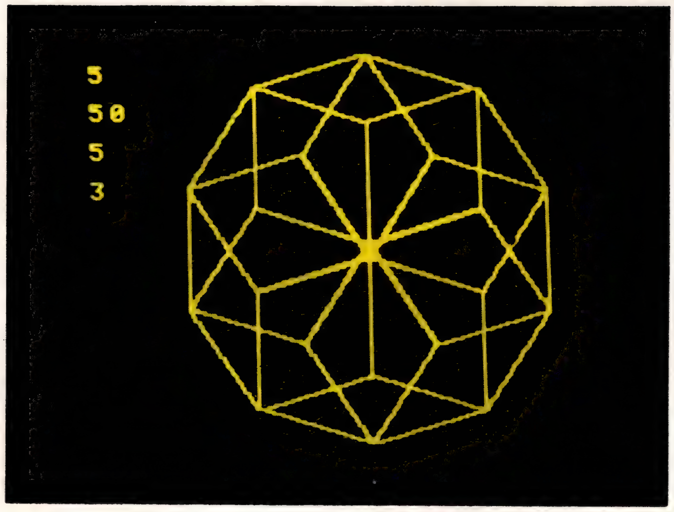

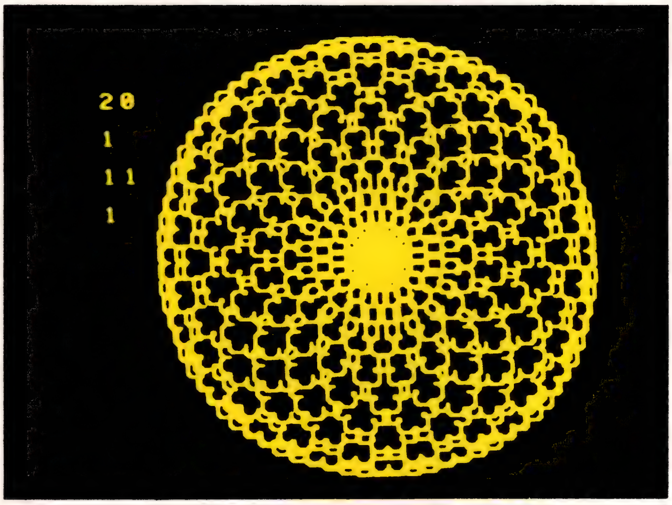

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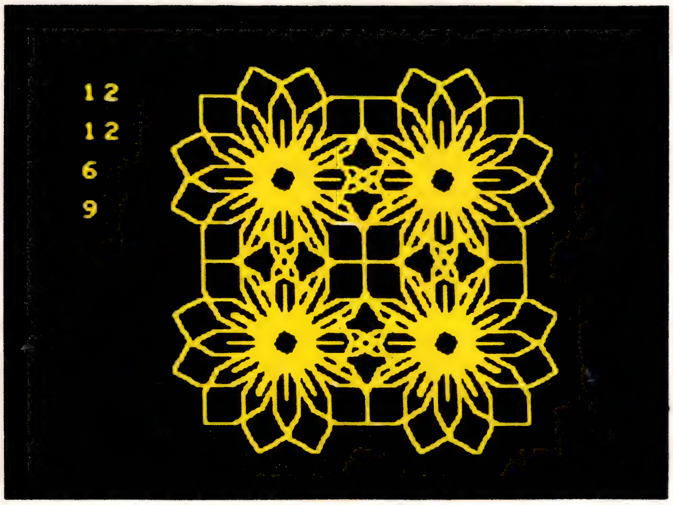
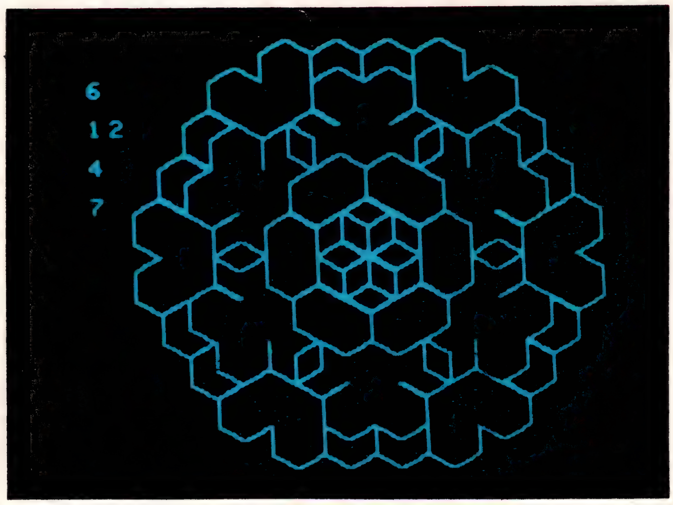
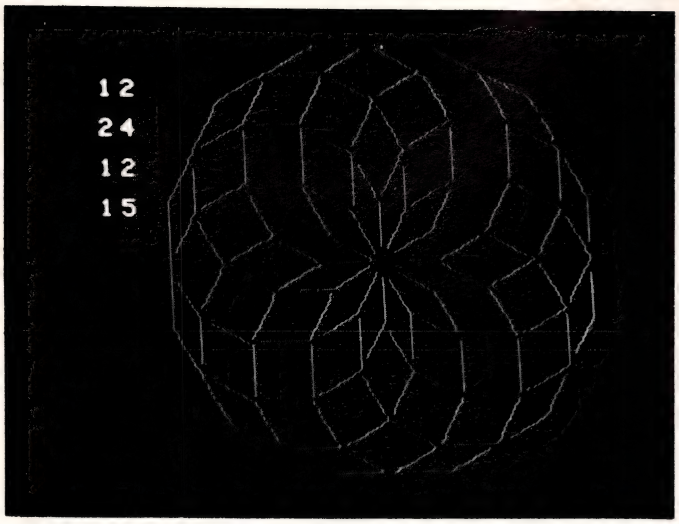
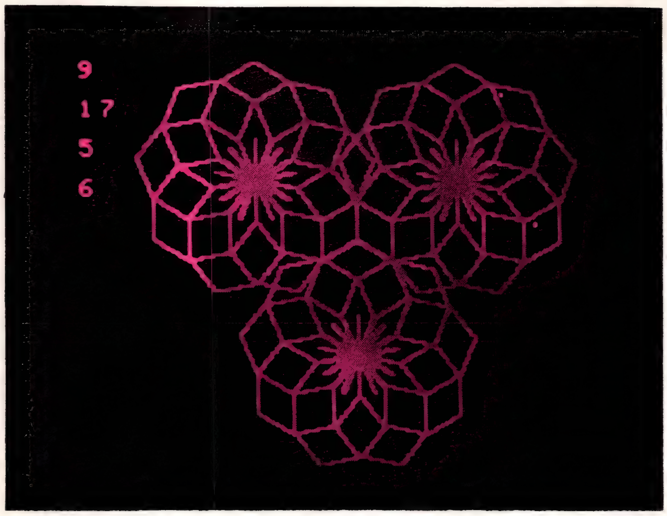
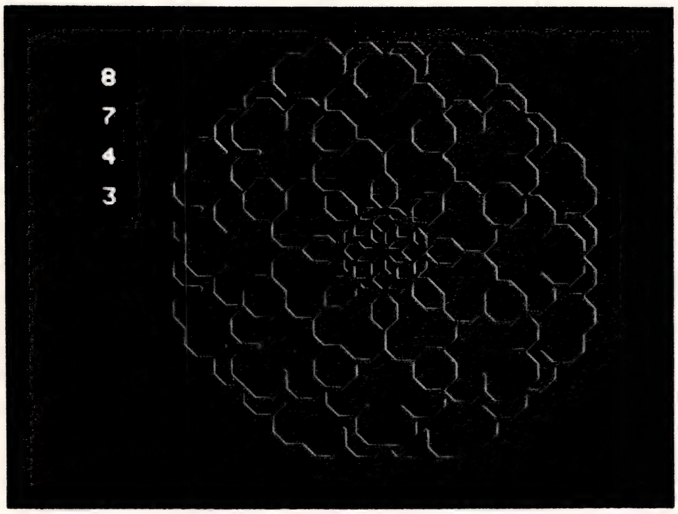










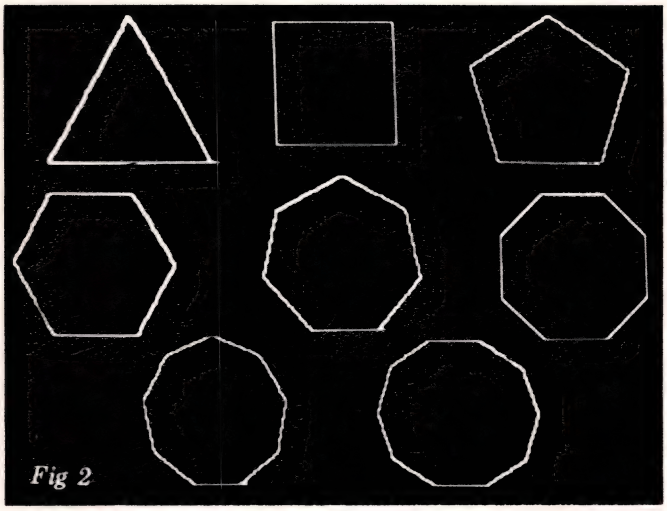


Fig 2

YGONS

Malcolm Banthorpe shows how to implement 'Turtle' graphics on the Apple II.

This article describes a simple method of drawing any equal-sided polygon in high resolution graphics and leads to a versatile pattern generating program with scope for further development. The programs are designed for use on the Apple but details for adaption to other computers with suitable graphics resolution are also given.

The most common way of using high resolution graphics to draw a line on a VDU is to specify the co-ordinates of its endpoints. For example, in Palsoft/Applesoft Basic you could type in, say, HPLOT 10, 10 TO 200, 150 and the interpreter would do the rest, joining the points 10,10 and 200,150. You could then go on to type HPLOT TO 60,100 and the interpreter would draw a line from the most recently plotted point (ie, 200, 150) to 60,100.

Commands similar to HPLOT are used in many other computers with high resolution graphics as a means of drawing lines. There is, however, another way of specifying to a computer the line that you wish to be drawn, which can be advantageous in some circumstances. I'm referring to so-called 'turtle' graphics in which an imaginary turtle moves around the screen leaving a trail of activated pixels in its wake. It can obey two sorts of instructions: either how far to move forward or what angle it should turn through. Although Palsoft/Applesoft has no turtle commands as such, the same effect can quite easily be achieved, with the result that some graphics programs can be simplified and made to execute more quickly.

The technique involves the use of a shape table to define the simplest plottable shape, ie, a single vector of unit length. It is then possible by using a SCALE= command to make the line any length, to a maximum of 255. Using ROT=, the line can be turned through any angle up to 360 degrees.

POLYGONS

Actually, it's not quite true that it can be turned through *any* angle, as ROTation can only be defined as an integer in the range 1 to 64 (ie, 64 = 360 degrees, 32 = 180 degrees, 8 = 45 degrees and so on) and consequently some angles, such as 30 degrees, cannot be defined precisely because this would require a ROTation of 5.333. The command DRAW is then used to put the line on the screen

For example, DRAW 1 AT 100,50 will draw SHAPE 1 at coordinates 100,30. DRAW 1 (omitting the coordinates) will draw SHAPE 1, starting from the last plotted point. In this way, where the shape is a line as described above, one line may be joined to another ad infinitum with length and rotation varied, but with the only coordinates required being those of the starting point.

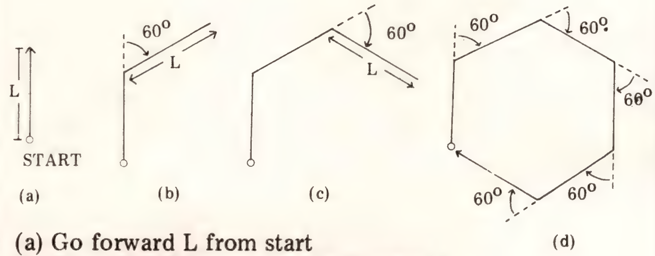
Now for a simple application of the system. To draw an equal-sided polygon with N sides of length L, we could, in general terms, proceed as follows:

1) Define the starting point.
2) Go forward a distance L.
3) Turn 360/N degrees.
4) Repeat from 2) until N lines have been drawn (see Figure 1 for a practical example).

This can be translated into a simple Basic program to draw any equal-sided polygon, as shown in Listing 1.

The limitation imposed by the fact that there are only 64 possible degrees of rotation means that some of the polygons are not absolutely accurate but, as can be seen from Figure 2, they are not too bad, taking into account the resolution of the graphics. As the number of sides is increased, the polygon approaches a circle and this program can be quite useful as a fast method of drawing circles without the need for the computation of any sines or cosines, which generally make for slow execution times. Beware of using a scale of less than 4 for drawing circles as this will fail to produce a smooth curve.

My interest in computer art led me to experiment with the possibility of using polygons to generate patterns. One idea was to use just parts of polygons (eg, just the first four sides of a pentagon) and to repeat these shapes, starting each successive part-polygon where the previous one ended. The initial results proved to be fairly uninteresting, showing little variety. I then tried submitting the turtle to a 180-degree shift every so often so that the line would turn back upon itself. This proved to give more interesting patterns and led to the program shown in Listing 2. Some of the results are



(a) Go forward L from start
(b) Turn 360/6 degrees and go forward L.
(c) Repeat (b)
(d) Repeat (b) until six sides have been drawn

Fig 1. The construction of a hexagon, using turtle commands

```
5  REM  POLYGON GENERATOR 1
6  REM
10  TEXT : HOME
17  REM
18  REM  SET UP SHAPE TABLE
19  REM
20  FOR I = 800 TO 805
30  READ C
40  POKE I,C
50  NEXT I
60  POKE 232,32: POKE 233,3
70  INPUT "HOW MANY SIDES ?";N
75  INPUT "SIDE LENGTH ?";L
80 K = 64 / N:R = 0: SCALE= L
90  HGR : HCOLOR= 3
97  REM
98  REM  PLOT STARTING POINT
99  REM
100  HPLOT 180,80
107  REM
108  REM  DRAW POLYGON
109  REM
110  FOR I = 1 TO N
120  ROT=  INT (R + 0.5)
130  DRAW 1
140 R = R + K
150  NEXT I
160  END
167  REM
168  REM  SHAPE TABLE DATA
169  REM
170  DATA 1,0,4,0,4,0
```

Listing 1

```
 95 REM POLY-PATTERN GENERATOR
 96 REM
 97 REM BY MALCOLM BANTHORPE
 98 REM
 99 REM
100 TEXT: HOME
110 INPUT “SYMMETRY ?”; S
120 A = 64/S
140 INPUT “SCALE ?”; L
160 INPUT “M ?”;M
170 INPUT “F ?”; F
180 FOR I = 800 TO 805: READ C: POKE I,C: NEXT I
190 POKE 232,32: POKE 233,3
200 HGR2: HCOLOR = 3: SCALE = L
210 HPLOT 180,96
220 FOR H = 1 TO S
230 FOR I = 1 TO S
240 FOR J = 1 TO 2
250 FOR K = 1 TO M
260 ROT = INT (R + 0.5)
270 DRAW 1
280 R = R + A
290 IF R > 64 THEN R = R – 64
300 NEXT K
310 R = R + 32 – A
320 IF R > 64 THEN R = R – 64
330 NEXT J
340 R = R + F * A
350 IF R > 64 THEN R = R – 64
360 NEXT I
370 R = R + F * A
380 IF R > 64 THEN R = R – 64
390 NEXT H
400 END
410 DATA 1,0,4,0,4,0
```

Listing 2

shown in the accompanying photographs, which also show the input parameters used.

The program first asks for four parameters to be inputted. These are Symmetry (how many sides would a complete polygon have?), Scale (length of side) and two other factors M and F which will determine the actual form of the pattern. As the examples show, an enormous range of variations is possible and it is almost impossible to predict what type of pattern will be produced from a given set of parameters. Incidentally, although six-fold symmetry occurs widely in nature in such diverse systems as snowflakes and honeycombs, this particular program does not seem to do very well with that particular number: five, seven and eight all provide a better selection of designs. It is possible that, with some modification to the program, this deficiency could be overcome. The scale is alone among the four parameters in that it does not affect the form of the pattern, merely its size, but if set too high the design will exceed the screen dimensions and will 'wrap round' to produce some further possible variation.

This program is by no means *the* definitive program for producing this type of pattern, and there is considerable room for further variation. Here are some possible changes that you may like to try:

1) My program uses four loops, but there is no reason why further loops should not be introduced together with more user-defined parameters;

2) Use XDRAW 1 instead of DRAW 1. This will have the effect of erasing any line or part line which is subsequently overdrawn. Even values of F produce patterns which eventually tend to erase themselves completely;

3) The scale could be varied during the program (eg, doubled or halved) to give some variation of line length;

4) Similarly, the variable A (the turning angle) could be varied within the program;

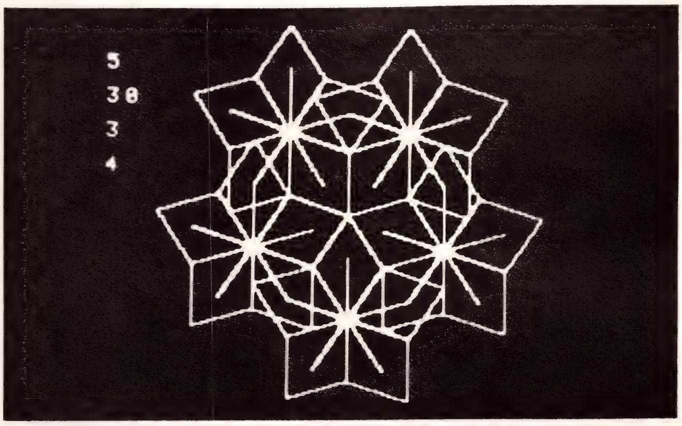
5) If you have colour available, this could be put to good use.

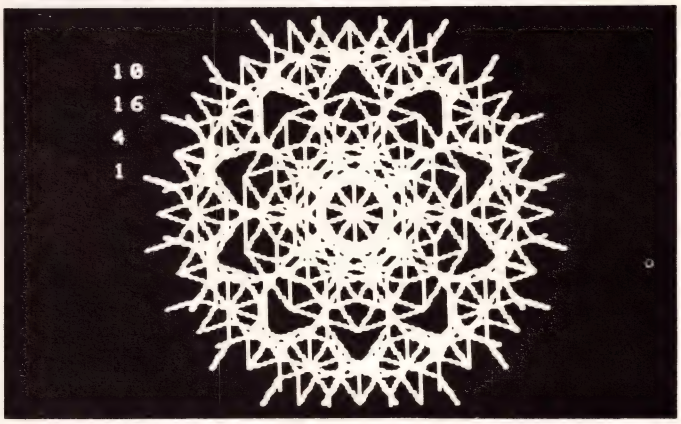
The use of colour is particularly effective in displaying composite patterns of differing scales, M and F, but with the same or related symmetry, eg, 16 and 8, or 10 and 5. With the use of a different plotting colour for each set of parameters, complex designs can be created.

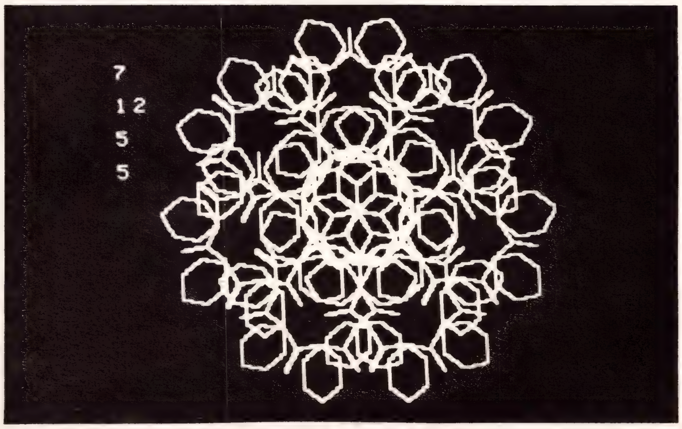
Adaptation to other computers is not difficult, but as most of them do not have the shape table facility, this must be circumvented by using more conventional line drawing techniques. As an example of what is required, a version of the original polygon generator program in Palsoft/Applesoft, which does not use a shape table, is shown in Listing 3. While this version of the program is slower, it is more accurate than the previous one, as it is not limited to 64 degrees of rotation and there should be little problem in adapting it to other Basics. Similarly, this technique may be applied to the main pattern-generating program. More care must be taken to limit the scale so that the size of the pattern does not exceed the screen, since wrap-round will not occur and the program will crash with an 'illegal quantity error'.

```
3  REM  POLYGON GENERATOR 2
4  REM
5 PI = 3.141592654
10  TEXT : HOME
70  INPUT "HOW MANY SIDES ?";N
75  INPUT "SIDE LENGTH ?";L
80 K = 2 * PI / N:R = 0
90  HGR : HCOLOR= 3
97  REM
98  REM   PLOT STARTING POINT
99  REM
100 X = 180:Y = 80: HPLOT X,Y
107  REM
108  REM  DRAW POLYGON
109  REM
110  FOR I = 1 TO N
120 X = X + L *  SIN (R)
125 Y = Y + L *  COS (R)
130  HPLOT  TO X,Y
140 R = R + K
150  NEXT I
160  END
```

Listing 3







FIRMWARE CASSETTE UTILITY

The design for an easy-to-build eprom programmer will have been published in the January issue of Electronics Australia *by the time you receive this issue of APC. It is suitable for programming the 2716 eprom used in this project. Our thanks to that magazine for the timely article.*

This is the first of a series of articles which are oriented towards useful hardware and software additions to the TRS-80 and System 80. The following article presents software and hardware details for the System 80 to allow fitting of an eprom (available from the author) with a useful cassette utility. Other software such as lower case driver, key debounce, etc. can also be located in the eprom. Future articles will include an add-on board for the eprom to allow use on the TRS-80; a 3 port I/O board with software (to allow programming of 2716 style eproms with the port board) and a printed cct board to allow fitting of a 2716 style character generator. This will allow you to design your own custom characters and use all of the 12x6 character matrix that is available in the System 80 or TRS-80.

SOFTWARE IMPROVEMENTS

Loading and saving of system tapes in the System 80/TRS-80 can be a frustrating process at the best of times. Two previously presented APC utilities, 'System Tape Generator' (April, 1981) and 'System Tape Loader' (January, 1981) helped greatly in the loading and saving of machine language tapes, however both resided in part of my valuable 16k of memory. The following methods are used to combine the two utilities and provide them in eprom located in a suitable area of memory.

The software presented by M. Dinn in issue 8 (January, 1981) was excellent but needed a couple of refinements before going into eprom. The method of cassette selection was tidied up by providing a small routine to display a prompt message and allow selection of cassette number 1 or 2. At the same time a routine was added to initialise the disk Basic keyword vector for 'LOAD' to the cassette load routine.

After these alterations two small bugs remained: the cassette loader upset the TRS232 driver in my word-processor program and the stack used by the Z80 processor was overwriting parts of the loaded program. The first problem was cured by loading 403DH with 0 at the end of the load routine and the second by altering the stack pointer register (SP) to an unused area of RAM (actually the I/O buffer).

The SAVE routine as presented in the April 1981 issue of APC was unsuitable in its initial form. No provision had been made in the assembly listing to input the various tape parameters, so a fairly extensive routine was added to allow input of the start, end, and executive addresses, and the file name. As in the previous example the disk Basic keyword 'SAVE' was initialised to this routine.

Comments have been added to the changed portions of the assembly listing for more detailed explanation. (See listing 1).

HARDWARE DETAILS

Detailed inspection of the documentation with either of the 80s reveals an area of memory which is unassigned between 3000 and 37FF Hex. The last few bytes of this 2k block are used by disk I/O, cassette functions and the real time clock, but the remainder is wasted address space.

Anyone who has removed the top cover of their System 80 will have noticed a vacant 24 pin chip below the Level 2 ROMs. This vacant position has data and address lines as well as chip select all terminated. Tracing through the circuit diagram reveals that the chip select is already decoded for the block 3000 – 37FF Hex (pin 5 of Z22), however the data buffers were disabled by this chip select line (pin 5 of Z22 goes to pin 12 of Z21). Enabling the buffers was as simple as finding and cutting the track between the two pins.

All that remained was to fit a socket in the vacant position and rearrange the connections for the 2716.

If your machine has no disk system, the last few bytes of this block (which conflict with disk operation) do not have to be disabled provided a value of FF remains in each of these locations as the processor normally sees this value in blank memory blocks. Filling the last 32 bytes of the eprom with FFs will ensure that the processor does not try to boot a non existant drive.

WIRING DETAILS

You will need a solder sucker and a 24 pin socket to perform this modification. Follow the steps below and refer to figures 1 and 2 as you go.

1. Remove all solder from the holes in the vacant ROM position (Z13). Be careful NOT to overheat the P.C. pads.
2. Separate pins 20 and 21 of Z13's position and fit the socket.
3. Disconnect the 4.7k resistor by cutting the track away from pin 21 and reconnect it to pin 20.
4. Connect pin 21 to 5V (pin 24 is a suitable point).
5. Locate the track from pin 5 of Z22 to pin 12 of Z21 and open circuit it with a small cut. Refer to figure 2 if you are unsure of the track.

That's it – you're finished. All that you have to do is to place a suitable eprom in the socket. It is worth noting that normally pin 18 of a 2716 is low in the read mode; this condition is satisfied as pin 18 (address 11) is low for the 2k block 3000 to 37FF. Disk owners should note that this modification will not be compatible with their systems.

The cassette LOAD/SAVE routine is assembled at 3000H. It will be of most benefit to those without disk drives, stringy floppies, etc. To initialise the routines, type 'SYSTEM' and then '/12288'. The READY prompt should reappear almost instantly. To load a tape, type 'LOAD' and to save type 'SAVE'. Backup copies can be easily made using the LOAD/SAVE commands

When using the SAVE command care must be taken as the software does not check for valid characters. If a mistake is made press the BREAK key and retype the required parameters. The ENTER key does not have to be pressed as the software steps the cursor along after each group of four characters and starts the cassette automatically once the sixth file name character is keyed. If you are making backup copies of programs which occupy all 16k you must not return to Basic to access the SAVE routine as the stack used by Level 2 Basic will write over parts of the code. In cases such as this, you must execute from 3037 Hex or 12330 Decimal (/12330) after the tape has loaded and the SYSTEM prompt reappears.

Eproms programmed with this software are available from the author for $12.50, including postage. A single key Basic which block moves to RAM and a lower case driver routine can be included at no extra cost, if requested. Write to me at 25 Malabar St, Launceston, Tas 7250.

In the next article details will be presented on a small board which will allow TRS-80 owners and those with disk systems to fit an eprom to this location. Logic will be included to disable the eprom for the last 32 bytes making it fully compatible with disk systems.

Fig 1

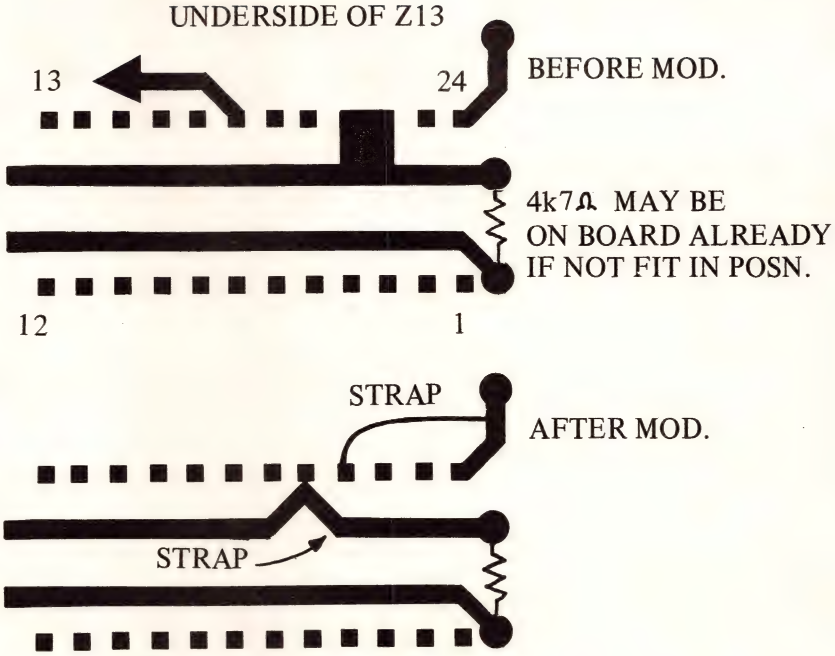
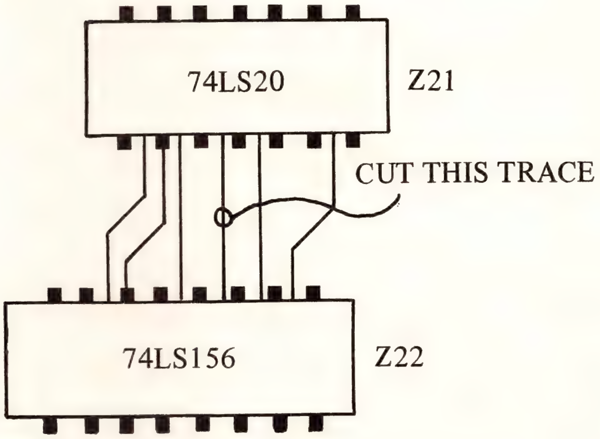
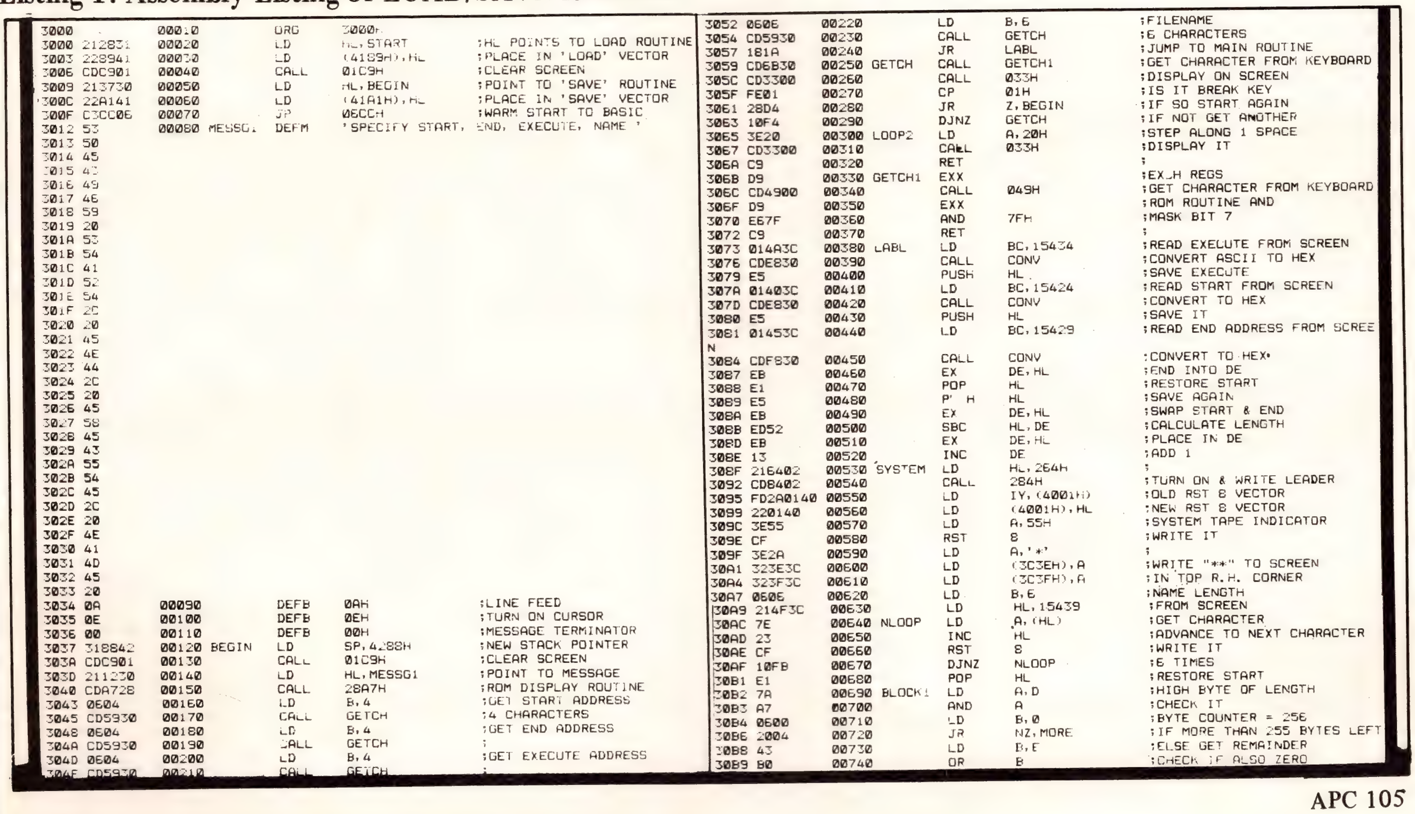


Fig 2



Listing 1: Assembly Listing of LOAD/SAVE Routines.



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3000           00010          ORG     3000H
3000 212831    00020          LD      HL,START      ;HL POINTS TO LOAD ROUTINE
3003 228941    00030          LD      (4189H),HL    ;PLACE IN 'LOAD' VECTOR
3006 CDC901    00040          CALL    01C9H         ;CLEAR SCREEN
3009 213730    00050          LD      HL,BEGIN      ;POINT TO 'SAVE' ROUTINE
300C 22A141    00060          LD      (41A1H),HL    ;PLACE IN 'SAVE' VECTOR
300F C3CC06    00070          JP      06CCH         ;WARM START TO BASIC
3012 53        00080 MESSG1   DEFM    'SPECIFY START, END, EXECUTE, NAME '
3013 50
3014 45
3015 43
3016 49
3017 46
3018 59
3019 20
301A 53
301B 54
301C 41
301D 52
301E 54
301F 2C
3020 20
3021 45
3022 4E
3023 44
3024 2C
3025 20
3026 45
3027 58
3028 45
3029 43
302A 55
302B 54
302C 45
302D 2C
302E 20
302F 4E
3030 41
3031 4D
3032 45
3033 20
3034 0A        00090          DEFB    0AH           ;LINE FEED
3035 0E        00100          DEFB    0EH           ;TURN ON CURSOR
3036 00        00110          DEFB    00H           ;MESSAGE TERMINATOR
3037 318842    00120 BEGIN    LD      SP,4288H      ;NEW STACK POINTER
303A CDC901    00130          CALL    01C9H         ;CLEAR SCREEN
303D 211230    00140          LD      HL,MESSG1     ;POINT TO MESSAGE
3040 CDA728    00150          CALL    28A7H         ;ROM DISPLAY ROUTINE
3043 0604      00160          LD      B,4           ;GET START ADDRESS
3045 CD5930    00170          CALL    GETCH         ;4 CHARACTERS
3048 0604      00180          LD      B,4           ;GET END ADDRESS
304A CD5930    00190          CALL    GETCH         ;
304D 0604      00200          LD      B,4           ;GET EXECUTE ADDRESS
304F CD5930    00210          CALL    GETCH         ;
3052 0606      00220          LD      B,6           ;FILENAME
3054 CD5930    00230          CALL    GETCH         ;6 CHARACTERS
3057 181A      00240          JR      LABL          ;JUMP TO MAIN ROUTINE
3059 CD6B30    00250 GETCH    CALL    GETCH1        ;GET CHARACTER FROM KEYBOARD
305C CD3300    00260          CALL    033H          ;DISPLAY ON SCREEN
305F FE01      00270          CP      01H           ;IS IT BREAK KEY
3061 28D4      00280          JR      Z,BEGIN       ;IF SO START AGAIN
3063 10F4      00290          DJNZ    GETCH         ;IF NOT GET ANOTHER
3065 3E20      00300 LOOP2    LD      A,20H         ;STEP ALONG 1 SPACE
3067 CD3300    00310          CALL    033H          ;DISPLAY IT
306A C9        00320          RET                   ;
306B D9        00330 GETCH1   EXX                   ;EXCH REGS
306C CD4900    00340          CALL    049H          ;GET CHARACTER FROM KEYBOARD
306F D9        00350          EXX                   ;ROM ROUTINE AND
3070 E67F      00360          AND     7FH           ;MASK BIT 7
3072 C9        00370          RET                   ;
3073 014A3C    00380 LABL     LD      BC,15434      ;READ EXELUTE FROM SCREEN
3076 CDE830    00390          CALL    CONV          ;CONVERT ASCII TO HEX
3079 E5        00400          PUSH    HL            ;SAVE EXECUTE
307A 01403C    00410          LD      BC,15424      ;READ START FROM SCREEN
307D CDE830    00420          CALL    CONV          ;CONVERT TO HEX
3080 E5        00430          PUSH    HL            ;SAVE IT
3081 01453C    00440          LD      BC,15429      ;READ END ADDRESS FROM SCREE
N
3084 CDE830    00450          CALL    CONV          ;CONVERT TO HEX
3087 EB        00460          EX      DE,HL         ;END INTO DE
3088 E1        00470          POP     HL            ;RESTORE START
3089 E5        00480          PUSH    HL            ;SAVE AGAIN
308A EB        00490          EX      DE,HL         ;SWAP START & END
308B ED52      00500          SBC     HL,DE         ;CALCULATE LENGTH
308D EB        00510          EX      DE,HL         ;PLACE IN DE
308E 13        00520          INC     DE            ;ADD 1
308F 216402    00530 SYSTEM   LD      HL,264H       ;
3092 CD8402    00540          CALL    284H          ;TURN ON & WRITE LEADER
3095 FD2A0140  00550          LD      IY,(4001H)    ;OLD RST 8 VECTOR
3099 220140    00560          LD      (4001H),HL    ;NEW RST 8 VECTOR
309C 3E55      00570          LD      A,55H         ;SYSTEM TAPE INDICATOR
309E CF        00580          RST     8             ;WRITE IT
309F 3E2A      00590          LD      A,'*'         ;
30A1 323E3C    00600          LD      (3C3EH),A     ;WRITE "**" TO SCREEN
30A4 323F3C    00610          LD      (3C3FH),A     ;IN TOP R.H. CORNER
30A7 0606      00620          LD      B,6           ;NAME LENGTH
30A9 214F3C    00630          LD      HL,15439      ;FROM SCREEN
30AC 7E        00640 NLOOP    LD      A,(HL)        ;GET CHARACTER
30AD 23        00650          INC     HL            ;ADVANCE TO NEXT CHARACTER
30AE CF        00660          RST     8             ;WRITE IT
30AF 10FB      00670          DJNZ    NLOOP         ;6 TIMES
30B1 E1        00680          POP     HL            ;RESTORE START
30B2 7A        00690 BLOCK1   LD      A,D           ;HIGH BYTE OF LENGTH
30B3 A7        00700          AND     A             ;CHECK IT
30B4 0600      00710          LD      B,0           ;BYTE COUNTER = 256
30B6 2004      00720          JR      NZ,MORE       ;IF MORE THAN 255 BYTES LEFT
30B8 43        00730          LD      B,E           ;ELSE GET REMAINDER
30B9 B0        00740          OR      B             ;CHECK IF ALSO ZERO
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30BA 281A      00750          JR      Z,FINISH       ;
30BC 3E3C      00760 MORE     LD      A,3CH          ;BLOCK HEADER CODE
30BE CF        00770          RST     8              ;WRITE IT
30BF 78        00780          LD      A,B            ;BLOCK LENGTH
30C0 CF        00790          RST     8              ;WRITE IT
30C1 7D        00800          LD      A,L            ;LSB OF START
30C2 CF        00810          RST     8              ;WRITE IT
30C3 84        00820          ADD     A,H            ;ADD MSB FOR CHECKSUM
30C4 4F        00830          LD      C,A            ;AND REPLACE IT
30C5 7C        00840          LD      A,H            ;GET MSB AGAIN
30C6 CF        00850          RST     8              ;AND WRITE IT
30C7 7E        00860 BYTE1    LD      A,(HL)         ;FETCH BYTE
30C8 CF        00870          RST     8              ;WRITE IT
30C9 81        00880          ADD     A,C            ;ADD CHECKSUM
30CA 4F        00890          LD      C,A            ;AND REPLACE
30CB 23        00900          INC     HL             ;NEXT BYTE
30CC 1B        00910          DEC     DE             ;DECREMENT LENGTH
30CD 10F8      00920          DJNZ    BYTE1          ;LOOP FOR BYTES
30CF 79        00930          LD      A,C            ;CHECKSUM
30D0 CF        00940          RST     8              ;WRITE IT
30D1 CD2C02    00950          CALL    022CH          ;BLINK ASTERISK
30D4 18DC      00960          JR      BLOCK1         ;NEXT BLOCK
30D6 3E78      00970 FINISH   LD      A,78H          ;END CODE
30D8 CF        00980          RST     8              ;WRITE IT
30D9 E1        00990          POP     HL             ;EXECUTE ADD
30DA 7D        01000          LD      A,L            ;LSB OF EXECUTE
30DB CF        01010          RST     8              ;WRITE IT
30DC 7C        01020          LD      A,H            ;MSB OF EXECUTE
30DD CF        01030          RST     8              ;WRITE IT
30DE CDF801    01040          CALL    01F8H          ;TURN OFF CASSETTE
30E1 FD220140  01050          LD      (4001H),IY     ;RESTORE RST 8 VECTOR
30E5 C3AC02    01060          JP      02ACH          ;JUMP TO SYSTEM CUE
30E8 CD0431    01070 CONV     CALL    BIAS           ;SUBTRACT NECESSARY VALUE
30EB CD0D31    01080          CALL    ALNHI          ;AND ALIGN 4 M.S. BITS
30EE 67        01090          LD      H,A            ;PLACE IN H
30EF 03        01100          INC     BC             ;POINT TO NEXT CHARACTER
30F0 CD0431    01110          CALL    BIAS           ;SUBTRACT NECESSARY VALUE
30F3 84        01120          ADD     A,H            ;MERGE TO 8 BITS
30F4 67        01130          LD      H,A            ;REPLACE IN H REG
30F5 03        01140          INC     BC             ;POINT TO NEXT CHARACTER
30F6 CD0431    01150          CALL    BIAS           ;SUBTRACT NECESSARY VALUE
30F9 CD0D31    01160          CALL    ALNHI          ;ALIGN 4 M.S. BITS
30FC 6F        01170          LD      L,A            ;PLACE IN L REG
30FD 03        01180          INC     BC             ;NEXT CHARACTER
30FE CD0431    01190          CALL    BIAS           ;SUBTRACT NECESSARY VALUE
3101 85        01200          ADD     A,L            ;MERGE TO 8 BITS
3102 6F        01210          LD      L,A            ;INTO L REGISTER
3103 C9        01220          RET                    ;RETURN 2 BYTE ADD IN HL
3104 0A        01230 BIAS     LD      A,(BC)         ;LOAD A WITH ASCII CHAR
3105 D630      01240          SUB     30H            ;SUBTRACT 30 HEX
3107 FE0A      01250          CP      0AH            ;IS IT GREATER THAN 10
3109 F8        01260          RET     M              ;IF NOT RETURN
310A D607      01270          SUB     07H            ;OR CONVERT TO A-F
310C C9        01280          RET                    ;AND RETURN
310D 07        01290 ALNHI    RLCA                   ;ALIGN MOST SIGNIFICANT
310E 07        01300          RLCA                   ;4 BITS BY FOUR
310F 07        01310          RLCA                   ;LEFT ACCUMULATOR
3110 07        01320          RLCA                   ;ROTATES
3111 C9        01330          RET                    ;
3112 43        01340 MESS     DEFM    'CASSETTE NO 1 OR 2 ? '
3113 41
3114 53
3115 53
3116 45
3117 54
3118 54
3119 45
311A 20
311B 4E
311C 4F
311D 20
311E 31
311F 20
3120 4F
3121 52
3122 20
3123 32
3124 20
3125 3F
3126 20
3127 00        01350          DEFB    00H            ;MESSAGE TERMINATOR
3128 318842    01360 START    LD      SP,4288H       ;NEW STACK POINTER
312B CDC901    01370          CALL    01C9H          ;CLEAR SCREEN
312E 211231    01380          LD      HL,MESS        ;POINT TO MESSAGE
3131 CDA728    01390          CALL    28A7H          ;DISPLAY ON SCREEN
3134 D9        01400 INP      EXX                    ;EXCH REGS
3135 CD4900    01410          CALL    0049H          ;GET CHARACTER
3138 D9        01420          EXX                    ;EXCH REGS
3139 E67F      01430          AND     7FH            ;MASK BIT 7
313B CD3300    01440          CALL    0033H          ;DISPLAY BYTE ON SCREEN
313E FE31      01450          CP      31H            ;IS IT 1
3140 2002      01460          JR      NZ,CHECK       ;IF NOT CHECK
3142 1806      01470          JR      CAS1           ;IF 1 JUMP TO SELECT
3144 FE32      01480 CHECK    CP      32H            ;IS IT 2
3146 20E0      01490          JR      NZ,START       ;IF NOT BACK TO PROMPT
3148 1808      01500          JR      CAS2           ;IF 2 JUMP TO SELECT
314A 3E01      01510 CAS1     LD      A,1            ;CONFIGURE
314C 323D40    01520          LD      (403DH),A      ;RECORDER
314F AF        01530          XOR     A              ;# 1
3150 1807      01540          JR      REC            ;TO REC SELECT
3152 3E01      01550 CAS2     LD      A,1            ;CONFIGURE
3154 323D40    01560          LD      (403DH),A      ;RECORDER
3157 3E10      01570          LD      A,10H          ;# 2
3159 CD1202    01580 REC      CALL    212H           ;SELECT REC 1 OR 2
315C CD9602    01590          CALL    296H           ;GET SYNC
315F CD3502    01600 BYTE     CALL    235H           ;READ BYTE
3162 FE55      01610          CP      55H            ;FILE NAME
3164 20F9      01620          JR      NZ,BYTE        ;AGAIN IF NOT
3166 21D03F    01630          LD      HL,3FD0H       ;NAME WRITE LOCN
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3169 0606      01640          LD      B,6H           ;NAME CHAR COUNT
316B CD3502    01650 NAME     CALL    235H           ;READ NAME BYTE
316E 77        01660          LD      (HL),A         ;TO SCREEN
316F 23        01670          INC     HL             ;BUMP SCREEN
3170 10F9      01680          DJNZ    NAME           ;6 TIMES
3172 3EFF      01690          LD      A.0FFH         ;'FIRST' FLAG
3174 08        01700          EX      AF,AF'         ;SAVE IN A'
3175 CD2C02    01710 BLOCK    CALL    22CH           ;FLASH "*"
3178 CD3502    01720 ID       CALL    235H           ;READ BLOCK ID
317B FE78      01730          CP      78H            ;END ?
317D 2838      01740          JR      Z,ENTRY        ;TO ENTRY IF SO
317F FE3C      01750          CP      3CH            ;DATA BLOCK
3181 20F5      01760          JR.     NZ,ID          ;AGAIN IF NOT
3183 CD3502    01770          CALL    235H           ;READ BYTES IN BLOCK
3186 47        01780          LD      B,A            ;SAVE IN B
3187 CD1403    01790          CALL    314H           ;READ BLOCK ADDRESS
318A 85        01800          ADD     A,L            ;START CHECKSUM
318B 4F        01810          LD      C,A            ;SAVE CHECKSUM
318C 08        01820          EX      AF,AF'         ;'FIRST' FLAG
318D B7        01830          OR      A              ;ZERO ?
318E 2807      01840          JR      Z,FLAG         ;JP IF NOT FIRST
3190 11D83F    01850          LD      DE,3FD8H       ;FIRST BLOCK WRITE LOCN
3193 CDD731    01860          CALL    HLWR           ;WRITE FIRST BLOCK LOCN
3196 AF        01870          XOR     A              ;CLEAR 'FIRST' FLAG
3197 08        01880 FLAG     EX      AF,AF'         ;RESAVE FLAG IN A'
3198 CD3502    01890 DATA     CALL    235H           ;READ DATA BYTE
319B 11E03F    01900          LD      DE,3FE0H       ;WRITE LOCN
319E CDD731    01910          CALL    HLWR           ;WRITE DATA ADDR
31A1 77        01920          LD      (HL),A         ;DATA TO STORE
31A2 23        01930          INC     HL             ;INC STORE POINTER
31A3 81        01940          ADD     A,C            ;ADD CHECKSUM TO DATA
31A4 4F        01950          LD      C,A            ;RE SAVE CHECKSUM IN C
31A5 10F1      01960          DJNZ    DATA           ;DO 'NO BYTES' TIMES
31A7 CD3502    01970          CALL    235H           ;READ CHECKSUM
31AA B9        01980          CP      C              ;COMPARE WITH CALC
31AB 28C8      01990          JR      Z,BLOCK        ;NEXT BLOCK IF OK
31AD 67        02000          LD      H,A            ;ELSE READ TO H
31AE 69        02010          LD      L,C            ;AND CALC TO L
31AF 113A3C    02020          LD      DE,3C3AH       ;CHECKSUM WRITE LOCN
31B2 CDD731    02030          CALL    HLWR           ;WRITE CHECKSUM
31B5 1816      02040          JR      TROFF          ;JUMP TO 'SYSTEM' CUE
31B7 CD1403    02050 ENTRY    CALL    314H           ;READ ENTRY ADD
31BA 11E83F    02060          LD      DE,3FE8H       ;ENTRY WRITE LOCN
31BD CDD731    02070          CALL    HLWR           ;WRITE IT
31C0 E5        02080          PUSH    HL             ;SAVE ENTRY HEX
31C1 CD0232    02090          CALL    HEXDEC         ;ENTRY HEX TO DEC
31C4 11F03F    02100          LD      DE,3FF0H       ;WRITE LOCN
31C7 CDF331    02110          CALL    CHAR           ;WRITE FIRST DEC NO
31CA CDD731    02120          CALL    HLWR           ;WRITE OTHER DIGITS
31CD AF        02130 TROFF    XOR     A              ;CLEAR A
31CE 323D40    02140          LD      (403DH),A      ;RESTORE OUT FF STATUS
31D1 D3FE      02150          OUT     (0FEH),A       ;TURN OFF REC
31D3 E1        02160          POP     HL             ;RESTORE ENTRY HEX
31D4 C3AC02    02170          JP      02ACH          ;JUMP TO 'SYSTEM' CUE
31D7 F5        02180 HLWR     PUSH    AF             ;SAVE REGS
31D8 C5        02190          PUSH    BC             ;SAVE REGS
31D9 7C        02200          LD      A,H            ;FIRST PAIR IN A
31DA 4F        02210          LD      C,A            ;AND C
31DB CDE731    02220          CALL    PAIR           ;WRITE H
31DE 7D        02230          LD      A,L            ;2ND PAIR IN A
31DF 4F        02240          LD      C,A            ;AND C
31E0 CDE731    02250          CALL    PAIR           ;WRITE L
31E3 13        02260          INC     DE             ;INC SCREEN
31E4 C1        02270          POP     BC             ;RESTORE REGS
31E5 F1        02280          POP     AF             ;
31E6 C9        02290          RET                    ;SUBROUTINE END
31E7 0F        02300 PAIR     RRCA                   ;HI TO LO NIBBLE
31E8 0F        02310          RRCA                   ;
31E9 0F        02320          RRCA                   ;
31EA 0F        02330          RRCA                   ;
31EB CDF331    02340          CALL    CHAR           ;WRITE HI DIGIT
31EE 79        02350          LD      A,C            ;
31EF CDF331    02360          CALL    CHAR           ;WRITE LO DIGIT
31F2 C9        02370          RET                    ;SUBROUTINE END
31F3 CDF931    02380 CHAR     CALL    ASCII          ;GET ASCII OF A
31F6 12        02390          LD      (DE),A         ;WRITE TO SCREEN
31F7 13        02400          INC     DE             ;INC SCREEN
31F8 C9        02410          RET                    ;SUBROUTINE END
31F9 E60F      02420 ASCII    AND     0FH            ;MASK OUT HIGH NIBBLE
31FB C690      02430          ADD     A,90H          ;ADD 90H
31FD 27        02440          DAA                    ;
31FE CE40      02450          ADC     A,40H          ;ADD 40 W CARRY
3200 27        02460          DAA                    ;
3201 C9        02470          RET                    ;END SUBROUTINE
3202 C5        02480 HEXDEC   PUSH    BC             ;SAVE REGS
3203 D5        02490          PUSH    DE             ;SAVE REGS
3204 EB        02500          EX      DE,HL          ;HL TO DE
3205 AF        02510          XOR     A              ;CLEAR ANY CARRY
3206 ED62      02520          SBC     HL,HL          ;CLEAR HL
3208 010010    02530          LD      BC,1000H       ;B=10, C=0
320B AF        02540 LOOP     XOR     A              ;CLEAR CARRY
320C CB13      02550          RL      E              ;SHIFT HIGHEST
320E CB12      02560          RL      D              ;BIT INTO CARRY
3210 7D        02570          LD      A,L            ;
3211 8F        02580          ADC     A,A            ;DOUBLE 'L' WITH CARRY
3212 27        02590          DAA                    ;DEC ADJUST
3213 6F        02600          LD      L,A            ;
3214 7C        02610          LD      A,H            ;
3215 8F        02620          ADC     A,A            ;DOUBLE 'H' WITH CARRY
3216 27        02630          DAA                    ;DEC ADJUST
3217 67        02640          LD      H,A            ;
3218 79        02650          LD      A,C            ;
3219 8F        02660          ADC     A,A            ;DOUBLE C WITH CARRY
321A 4F        02670          LD      C,A            ;
321B 10EE      02680          DJNZ    LOOP           ;DO IT 10 TIMES
321D 79        02690          LD      A,C            ;TOP DIGIT TO A
321E D1        02700          POP     DE             ;RESTORE REGS
321F C1        02710          POP     BC             ;
3220 C9        02720          RET                    ;SUBROUTINE END
0000           02730          END
```

Programs

We welcome programs from readers for consideration for this section. But before you send in your masterpiece, please take note of the following.

We're looking for original, interesting and/or unusual programs for any of the popular personal computers; the more original your program, the more chance it has of being published. We're interested in more 'serious' programs as well as games. We're *not* interested in more Space Invaders, Rubik Cube solutions, Duck Shoots, etc!

When you've written your program and *thoroughly* debugged it (get a friend to try it out too!), put it on a cassette or disk and make certain it loads and runs correctly – we receive a lot which don't. We *must* have a printed-out listing, on plain, white paper done with fairly new ribbon to give a good, dark printout. If you haven't a printer, try your local computer club or even a dealer – let us know if anyone helped you to obtain a listing and we'll credit them in the magazine (e.g. 'Listing courtesy of Bloggs Computers'). Enclose a *brief* note saying exactly which machine it's for and how much memory is required. If the program requires instructions, these should be included within the program if possible, otherwise they should be listed very briefly. Put your name and address on each piece of paper you send us and on each disk/cassette. Finally, if you want your program returned, should we decide not to use it, please enclose a SAE! Send your program to: APC Programs, 462 Burwood Road, Hawthorn, 3122.

We receive lots of programs and evaluation takes quite a while so please, don't ring to ask whether we've received it and whether we're going to use it – we'll be in touch with you in due course.

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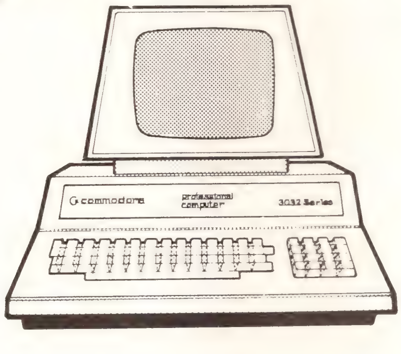

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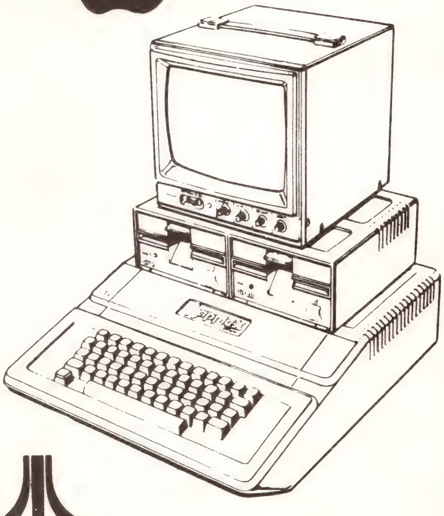

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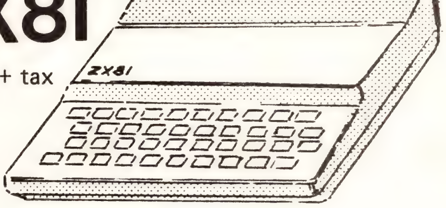

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GET SIMULATION

by Grant Nicmanis

Written for the Apple II +, this short routine will cause the Apple to wait for a key to be pressed and store the ASCII code for that key in the location specified in line 112 (10 in the listing).

The routine is completely relocatable (768($300) is used as the base address in this listing) and it is activated by a simple call to the address (eg CALL 768).

The routine can easily be modified to beep when a key is pressed by replacing line 116 by:

116 POKE 784,32:POKE 785,58:
POKE 787,96

or display the key pressed:

116 POKE 782,240
115 POKE 783,253

Unlike the GET command, this routine does not put a flashing cursor on the screen.

CORRECTIONS FOR PROGRAMS– GET Simulation

routine will cause the Apple to wait

116 POKE 784,32:POKE 785,58:
POKE 786,255:POKE 787,96

or display the key pressed:

114 POKE 782,240
115 POKE 783,253

Assembly Language Listing

```
0300-    2C 00 C0    BIT    $C000
0303-    10 FB       BPL    $0300
0305-    AD 00 C0    LDA    $C000
0308-    2C 10 C0    BIT    $C010
030B-    85 0A       3TA    $0A
030D-    20 8B FD    JSR    $FD8B
0310-    60          RTS
                     BRK
```

Basic Listing

```
100  POKE 768,44
101  POKE 769,0
102  POKE 770,192
103  POKE 771,16
104  POKE 772,251
105  POKE 773,173
106  POKE 774,0
107  POKE 775,192
108  POKE 776,44
109  POKE 777,16
110  POKE 778,192
111  POKE 779,133
112  POKE 780,10
113  POKE 781,32
114  POKE 782,139
115  POKE 783,253
116  POKE 785,96
```

The first correct entry out of the bag was from P. Newbery of St Marys, Sydney, with a solution of 4 roosters, 18 hens and 78 chicks. A book token is on its way to St Marys.

Our thanks also to the gentleman who provided *all* the foul answers to Puzzle No. 15 (sorry!)

QUICKIE

No answers, no prizes. A man is standing on a railway line and hears a train coming. He runs for safety as quickly as possible. However, he first runs 20 yards along the track towards the oncoming train. Why?

PRIZE PUZZLE

Two parts this month: a) find the smallest number that has exactly 104 factors, i.e. 104 different numbers that it divides by – including itself but excluding unity. For example, the number 12 has five factors – 2, 3, 4, 6 and 12. b) find the smallest odd number that has exactly 104 factors.

Answers on postcards please, to: January Prize Puzzle, Lazing Around, APC, 462 Burwood Road, Hawthorn, 3122, to arrive no later than February 26, 1982.

BUG BUG

by D. Maher.

Bug Bug is an animated game for two players who fly their bugs (o and u) around the screen with the aim of "eating" 20 morsels (pixel blocks) as quickly as possible.

If the two players knock into each other (either accidentally or on purpose), one is sent crashing to the ground, and the resulting "pain" loses the victim one point.

You will notice in the listing that the bugs (set in line 50) consist of the "unobtainable" character " ". However by depressing the 'Z' key and the '2' key simultaneously and hitting the backspace twice, to get rid of the resulting characters, then barely touching the '4' key, you will get the desired result. Similarly, a number of other interesting characters can be obtained with the keys '1' through to '7' keys.

Instructions are included in the listing.

```
1 REM ====BUG-BUG (NO1) BY DAVID MAHER, 20/9/81
10 GOSUB 920:CLS
20 FOR X=0 TO 127:SET(X,0):SET(X,47):NEXT X
30 FOR Y=0 TO 47:SET(0,Y):SET(127,Y):NEXT Y
40 X=515:XX=451:BUG$=CHR$(129):GOSUB 800
50 A$(1)="\U/":A$(2)="-U-":A$(3)="/U\":A$(4)=A$(2):B$(1)="\O/":B$(2)="-O-":
   B$(3)="/O\":B$(4)=B$(2)
60 PRINT@10," BIRD -O- : 0 ";:PRINT@40," BIRD -U- : 0 ";
70 FOR I=1 TO 4
80 GOSUB 290:GOSUB 120
90 PRINT@X,A$(I);:PRINT@XX,B$(I);
100 NEXT I
110 GOTO 70
120 E$=INKEY$:IFE$<>""THEN130ELSEM$=Q$:MM$=QQ$:GOTO150
130 IFE$="W"ORE$="S"ORE$="A"ORE$="Z"THENMM$=E$:GOTO150
140 IFE$="I"ORE$="J"ORE$="K"ORE$="M"THENM$=E$
150 X1=X:X2=XX:IFM$="I"X=X-64:GOTO190
160 IFM$="K"X=X+3:GOTO190
170 IFM$="J"X=X-3:GOTO190
180 IFM$="M"X=X+64
190 IFMM$="W"XX=XX-64:GOTO230
200 IFMM$="S"XX=XX+3:GOTO 230
210 IFMM$="A"XX=XX-3:GOTO 230
220 IFMM$="Z"XX=XX+64
230 Q$=M$:QQ$=MM$
240 CH=X:GOSUB820:X=X+CI
250 CH=XX:GOSUB820:XX=XX+CI
260 PRINT@X1,"   ";:PRINT@X2,"   ";
270 GOSUB 870
280 RETURN
290 U=RND(9)
300 GOSUB 870
310 PRINT@BUG," ";
320 ON U GOTO 330,340,350,360,370,380,390
330 BUG=BUG+1:GOTO 400
340 BUG=BUG-1:GOTO 400
350 BUG=BUG-65:GOTO400
360 BUG=BUG-63:GOTO400
370 BUG=BUG+63:GOTO400
380 BUG=BUG+65:GOTO400
390 REM  ===BUG DOES NOT MOVE
400 CH=BUG:GOSUB 820:BUG=BUG+CI
410 PRINT@BUG,BUG$;
420 RETURN
430 S1=S1+1
440 PRINT@XX,B$(2);:PRINT@BUG," ";:PRINT@X,"   ";
450 PRINT@51,S1;
460 PRINT@X,"GULP";
470 FOR P=1 TO 300:NEXT P
480 IF S1=20THENPRINT@105,"WINNER !!";:GOTO1120
490 PRINT@X,"    ";
500 GOSUB 800
510 RETURN
520 S2=S2+1
530 PRINT@X,A$(2);:PRINT@BUG," ";:PRINT@XX,"   ";
540 PRINT@21,S2:
```

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```
550 PRINT@XX-1,"CHOMP";
560 FOR P=1 TO 300:NEXT P
570 IFS2=20THENPRINT@75,"WINNER !!";:GOTO 1120
580 PRINT@XX-1,"     ";
590 GOTO 500
600 R=RND(2)
610 IFR=1S1=S1-1:PRINT@51,S1;:GOTO630
620 S2=S2-1:PRINT@21,S2;:GOTO710
630 IFX>896THENPRINT@X,"OUCH"::FORP=1TO300:NEXTP:PRINT@X,"     ";:Q$="":
    RETURN
640 X=X+64
650 PRINT@X,A$(1);
660 PRINT@XX,B$(2);
670 FOR P=1 TO 30
680 NEXT P
690 PRINT@X,"   ":
700 GOTO 630
710 IFXX>896PRINT@XX,"CRASH";:FORP=1TO300:NEXTP:PRINT@XX,"     ";:
    QQ$="":RETURN
720 XX=XX+64
730 PRINT@XX,B$(1);
740 PRINT@X,A$(2);
750 FOR P=1 TO 30
760 NEXT P
770 PRINT@XX,"   ";
780 GOTO 710
790 REM ===SUBROUTINES
800 BUG=RND(14)x64+RND(40)+6
810 RETURN
820 IF CH<64 CI=64:RETURN
830 IF CH>960 CI=-64:RETURN
840 IF CH/64-INT(CH/64)>0.953125 CI=-3:RETURN
850 IF CH/64-INT(CH/64)<0.03125 CI=3:RETURN
860 CI=0:RETURN
870 IF X=BUG-1ORX=BUGORX=BUG+1GOSUB430
880 IF XX=BUG-1ORXX=BUGORXX= BUG+1GOSUB520
890 IF X=XX GOSUB 600
900 RETURN
910 REM ===INSTRUCTIONS
920 CLS
930 PRINT@530," B U G  -  B U G  (NO1)";
940 FOR P=1 TO 300:NEXT P
950 PRINT:PRINT
960 PRINT"          THE AIM OF THE GAME IS TO FLY YOUR"
970 PRINT"      BUG AROUND THE SCREEN, GULPING OR CHOMPING"
980 PRINT"      AS MANY MORSELS AS YOU CAN !!!"
990 PRINT"          THE RESULTS OF BUMPING INTO YOUR OPPONENT"
1000PRINT"      ARE UNPREDICTABLE - AND COSTLY !!!"
1010PRINT"          THE FIRST BUG TO CATCH 20 MORSELS WINS."
1020PRINT
1030PRINT"          BUG -O-                BUG -U-"
1040PRINT"          =======                ======="
1050PRINT"             W        BUG           I"
1060PRINT"          A  .  S   CONTROL      J  .  K"
1070PRINT"             Z       KEYS!          M"
1080PRINT
1090PRINT"             HIT ANYBODY TO CONTINUE!":
1100K$=INKEY$:IFK$=""THEN1100
1110RETURN
1120PRINT@153,"ANOTHER GAME ?"::INPUTK$:IFLEFT$(K$,1)="Y"RUN10
1130CLS:END
```

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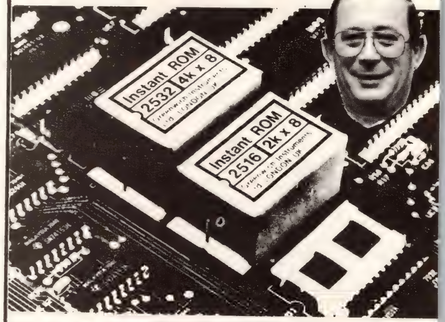

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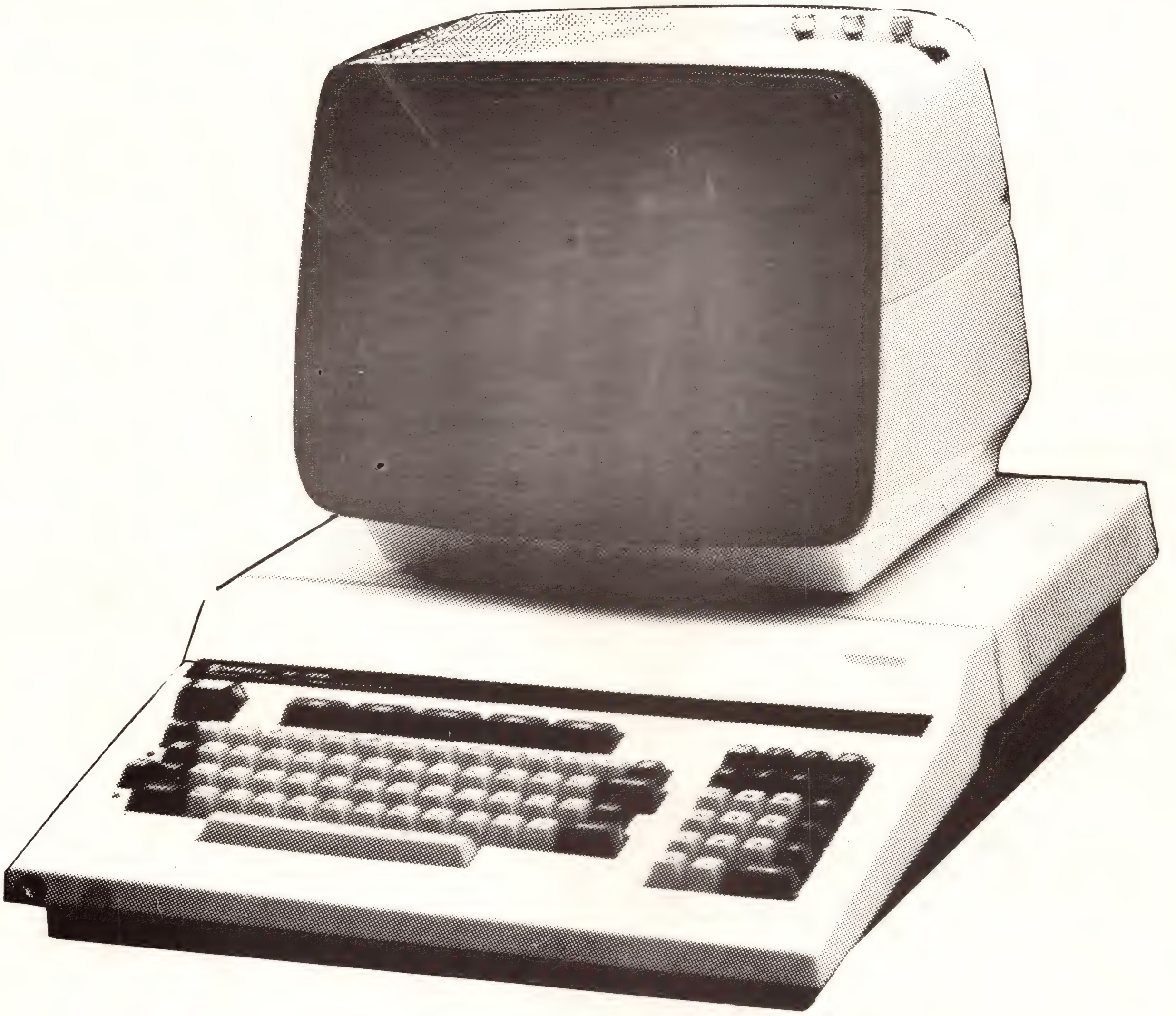

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CRYPTOGRAPHY

by Ed Richardson, Editor OSBUG Newsletter.

The program is written for the Superboard but should run on any micro using Microsoft Basic.

In all recorded history, mankind has shown great interest in sending secret messages. The process is called cryptography. The great problem with the common substitution or transposition ciphers used in the past, was that certain letters in languages occur more frequently than others. In the English language, E is used most frequently, followed by T and A. All that was required to decode any message was a sufficient amount of coded information to be available. Look up "Cryptography" in an encyclopaedia at your local library for more information on this fascinating subject.

If you generate random numbers from a "seed", and the Superboard can, you have at your command a way to place messages into a virtually unbreakable cipher. The Superboard's random number generator only has a sequence of about 1800 numbers before it repeats, which means the Military probably wouldn't have a lot of trouble cracking it, given sufficient coded information. Still, it could tie up a computer much bigger than the Superboard for some weeks. The "seed" gives the Superboard a starting point in the random number generating sequence, and the same sequence of random numbers will always be generated by the same seed. I should say PSEUDO-Random number generator.

Frankly, I can't see a lot of good use to put it to, but I'm sure you'll agree that it's an interesting program. The "seed", of course is pre-set or prearranged with the receiver of the message. The "seed" could be the price of gold in American dollars, as it appeared in the Australian Newspaper on the date that the message was sent. Say it was $US519.4, then the seed would be 519.4.

Try another seed and it won't decipher. Try another computer type for decoding and it won't work, even with the seed, unless the pseudo-random algorithm is identical.

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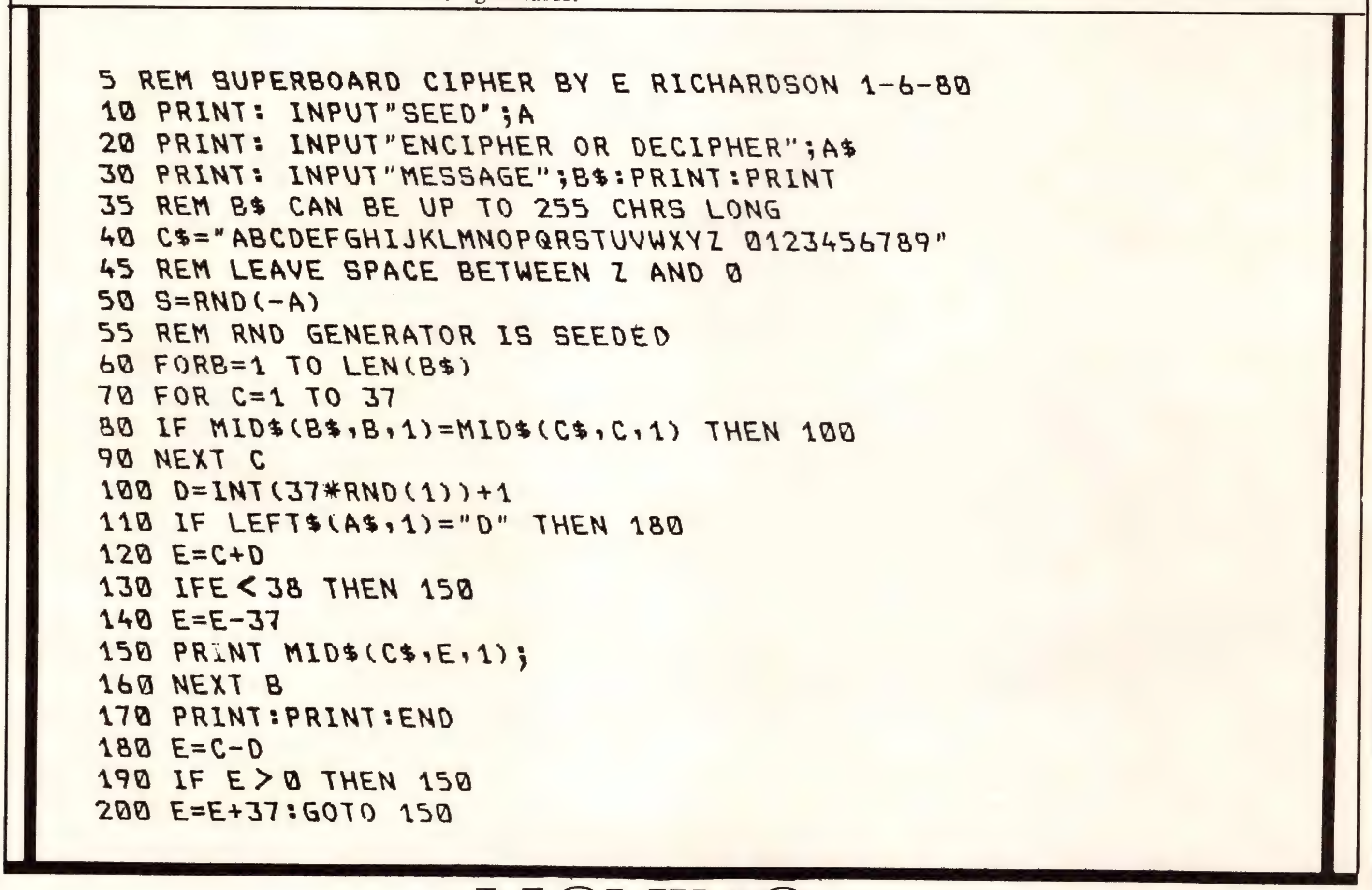
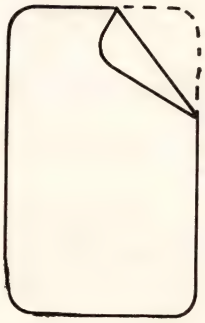


```
5 REM SUPERBOARD CIPHER BY E RICHARDSON 1-6-80
10 PRINT: INPUT"SEED";A
20 PRINT: INPUT"ENCIPHER OR DECIPHER";A$
30 PRINT: INPUT"MESSAGE";B$:PRINT:PRINT
35 REM B$ CAN BE UP TO 255 CHRS LONG
40 C$="ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789"
45 REM LEAVE SPACE BETWEEN Z AND 0
50 S=RND(-A)
55 REM RND GENERATOR IS SEEDED
60 FORB=1 TO LEN(B$)
70 FOR C=1 TO 37
80 IF MID$(B$,B,1)=MID$(C$,C,1) THEN 100
90 NEXT C
100 D=INT(37*RND(1))+1
110 IF LEFT$(A$,1)="D" THEN 180
120 E=C+D
130 IFE<38 THEN 150
140 E=E-37
150 PRINT MID$(C$,E,1);
160 NEXT B
170 PRINT:PRINT:END
180 E=C-D
190 IF E>0 THEN 150
200 E=E+37:GOTO 150
```

MOVING



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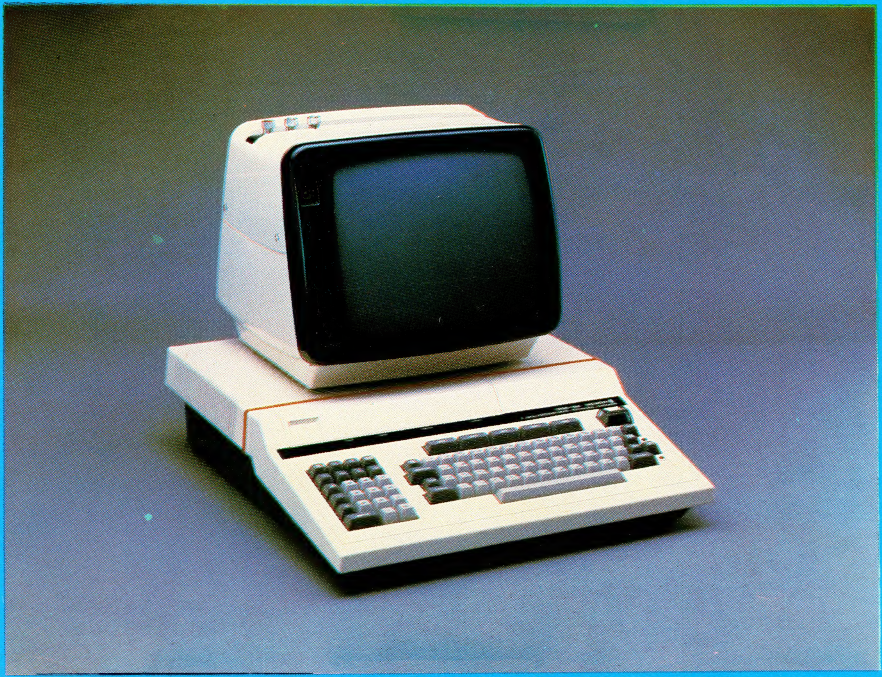

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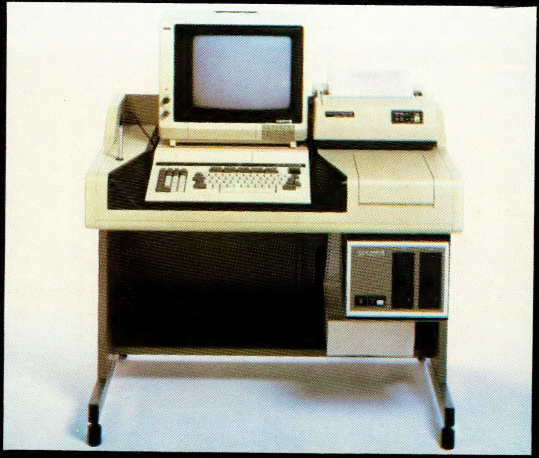

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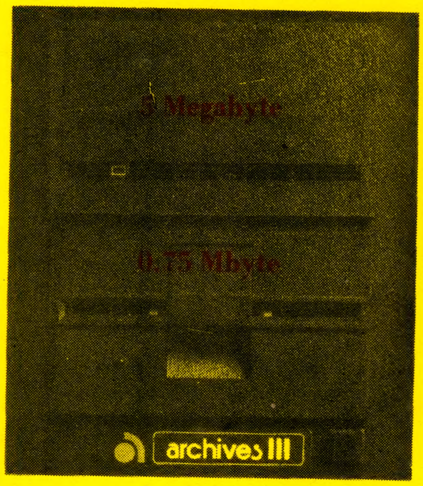

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